3

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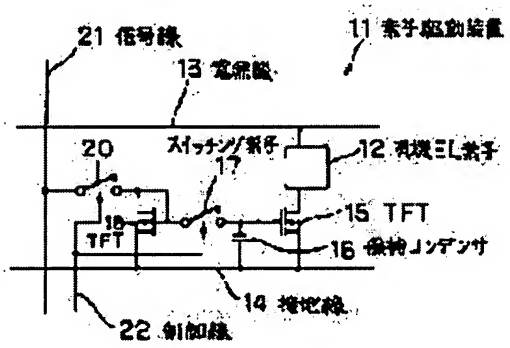
SASAKI HIROSHI

(54) ELEMENT DRIVING DEVICE AND METHOD AND IMAGE DISPLAY DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent operation defects due to voltage drop in the case of arranging many active elements like organic EL elements and performing matrix driving.

SOLUTION: When switching means 17 and 20 are turned to an ON state by the control signals of a control electrode 22, since the control current of a signal electrode 21 is converted into a control voltage by a second transistor 18, held in a voltage holding means 16 and applied to the gate electrode of a first transistor 15, the driving voltage of a power supply electrode 13 is converted into a driving current and supplied to the active element 12. Since not the control voltage but the control current is inputted to the signal electrode 21 so as to control the operation of the active element 12, even in the structure of connecting many active elements 12 to one signal electrode 21, an operation gap due to the voltage drop is not generated. Since the first and second transistors 15 and 18 form a current mirror circuit, the driving current corresponding to the control current of the signal electrode 21 is supplied to the active element 12.



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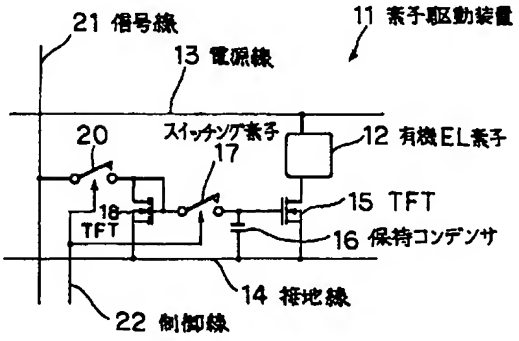
(54)【発明の名称】　素子駆動装置および方法、画像表示装置

(57)【要約】

【課題】　有機ＥＬ素子などの能動素子を多数配置してマトリクス駆動するような場合の電圧降下による動作不良を防止する。

【解決手段】　制御電極２２の制御信号によりスイッチング手段１７，２０がオン状態とされると、信号電極２１の制御電流が第二トランジスタ１８により制御電圧に変換されて電圧保持手段１６に保持され、第一トランジスタ１５のゲート電極に印加されるので、これで電源電極１３の駆動電圧が駆動電流に変換されて能動素子１２に供給される。能動素子１２を動作制御するために信号電極２１には制御電圧でなく制御電流が入力されるので、一個の信号電極２１に多数の能動素子１２が接続される構造でも電圧降下による動作格差が発生しない。第一第二トランジスタ１５，１８がカレントミラー回路を形成するため、能動素子１２には信号電極２１の制御電流に対応した駆動電流を供給できる。



1

【特許請求の範囲】

【請求項１】　能動素子を可変自在な駆動電流で駆動制御する素子駆動装置であって、

所定の駆動電圧が印加される電源電極と、

この電源電極に印加される駆動電圧をゲート電極に印加される制御電圧に対応した駆動電流に変換して前記能動素子に供給する駆動トランジスタと、

前記能動素子を駆動制御するための制御電流が供給される信号電極と、

該信号電極に供給される制御電流を制御電圧に変換する電流変換素子と、

この電流変換素子により変換された制御電圧を保持して前記駆動トランジスタのゲート電極に印加する電圧保持手段と、

この電圧保持手段の電圧保持を動作制御するための制御信号が入力される制御電極と、

この制御電極に入力される制御信号に対応して前記電圧保持手段と前記電流変換素子との接続をオンオフする第一スイッチング手段と、

前記制御電極に入力される制御信号に対応して前記信号電極と前記電流変換素子との接続をオンオフする第二スイッチング手段と、を具備している素子駆動装置。

【請求項２】　可変自在な駆動電流で駆動制御される能動素子と、

所定の駆動電圧が印加される電源電極と、

この電源電極に印加される駆動電圧をゲート電極に印加される制御電圧に対応した駆動電流に変換して前記能動素子に供給する駆動トランジスタと、

前記能動素子を駆動制御するための制御電流が供給される信号電極と、

該信号電極に供給される制御電流を制御電圧に変換する電流変換素子と、

この電流変換素子により変換された制御電圧を保持して前記駆動トランジスタのゲート電極に印加する電圧保持手段と、

この電圧保持手段の電圧保持を動作制御するための制御信号が入力される制御電極と、

この制御電極に入力される制御信号に対応して前記電圧保持手段と前記電流変換素子との接続をオンオフする第一スイッチング手段と、

前記制御電極に入力される制御信号に対応して前記信号電極と前記電流変換素子との接続をオンオフする第二スイッチング手段と、を具備している素子駆動装置。

【請求項３】　（ｍ×ｎ：ｍおよびｎは自然数）個の能動素子を可変自在な駆動電流で個々に駆動制御する素子駆動装置であって、

所定の駆動電圧が印加される電源電極と、

この一個の電源電極に印加される駆動電圧を各々のゲート電極に個々に印加される制御電圧に対応した駆動電流に個々に変換して（ｍ×ｎ）個の前記能動素子に個々に供給する（ｍ×ｎ）個の駆動トランジスタと、

（ｍ×ｎ）個の前記能動素子を個々に駆動制御するためのｎ個の制御電流が各々に順番に供給されるｍ個の信号電極と、

これらｍ個の信号電極の各々に順番に供給されるｎ個の制御電流を（ｍ×ｎ）個の制御電圧に変換する（ｍ×ｎ）個の電流変換素子と、

これら（ｍ×ｎ）個の電流変換素子により変換された（ｍ×ｎ）個の制御電圧を個々に保持して（ｍ×ｎ）個の前記駆動トランジスタのゲート電極に個々に印加する（ｍ×ｎ）個の電圧保持手段と、

これら（ｍ×ｎ）個の電圧保持手段の電圧保持を個々に動作制御するための制御信号が順番に入力されるｎ個の制御電極と、

これらｎ個の制御電極に順番に入力されるｍ個の制御信号に対応して（ｍ×ｎ）個の前記電圧保持手段と（ｍ×ｎ）個の前記電流変換素子との接続を個々にオンオフする（ｍ×ｎ）個の第一スイッチング手段と、

ｎ個の前記制御電極に入力される制御信号に対応してｍ個の前記信号電極と（ｍ×ｎ）個の前記電流変換素子との接続を個々にオンオフする（ｍ×ｎ）個の第二スイッチング手段と、を具備している素子駆動装置。

【請求項４】　可変自在な駆動電流で駆動制御される（ｍ×ｎ）個の能動素子と、

所定の駆動電圧が印加される電源電極と、

この一個の電源電極に印加される駆動電圧を各々のゲート電極に個々に印加される制御電圧に対応した駆動電流に個々に変換して（ｍ×ｎ）個の前記能動素子に個々に供給する（ｍ×ｎ）個の駆動トランジスタと、

（ｍ×ｎ）個の前記能動素子を個々に駆動制御するためのｎ個の制御電流が各々に順番に供給されるｍ個の信号電極と、

これらｍ個の信号電極の各々に順番に供給されるｎ個の制御電流を（ｍ×ｎ）個の制御電圧に変換する（ｍ×ｎ）個の電流変換素子と、

これら（ｍ×ｎ）個の電流変換素子により変換された（ｍ×ｎ）個の制御電圧を個々に保持して（ｍ×ｎ）個の前記駆動トランジスタのゲート電極に個々に印加する（ｍ×ｎ）個の電圧保持手段と、

これら（ｍ×ｎ）個の電圧保持手段の電圧保持を個々に動作制御するための制御信号が順番に入力されるｎ個の制御電極と、

これらｎ個の制御電極に順番に入力されるｍ個の制御信号に対応して（ｍ×ｎ）個の前記電圧保持手段と（ｍ×ｎ）個の前記電流変換素子との接続を個々にオンオフする（ｍ×ｎ）個の第一スイッチング手段と、

ｎ個の前記制御電極に入力される制御信号に対応してｍ個の前記信号電極と（ｍ×ｎ）個の前記電流変換素子との接続を個々にオンオフする（ｍ×ｎ）個の第二スイッチング手段と、を具備している素子駆動装置。

3

【請求項５】　前記電流変換素子が抵抗素子からなる請求項１ないし４の何れか一記載の素子駆動装置。

【請求項６】　前記電流変換素子が前記駆動トランジスタとカレントミラー回路を形成する変換トランジスタからなる請求項１ないし４の何れか一記載の素子駆動装置。

【請求項７】　能動素子を可変自在な駆動電流で駆動制御する素子駆動装置であって、

所定の駆動電圧が印加される電源電極と、

この電源電極に印加される駆動電圧をゲート電極に印加される制御電圧に対応した駆動電流に変換して前記能動素子に供給する駆動トランジスタと、

前記能動素子を駆動制御するための制御電圧が供給される信号電極と、

前記駆動トランジスタとカレントミラー回路を形成する構造で前記信号電極に供給される制御電圧を自身の電気抵抗により制御電流として入力して制御電圧に変換する変換トランジスタと、

この変換トランジスタにより変換された制御電圧を保持して前記駆動トランジスタのゲート電極に印加する電圧保持手段と、

この電圧保持手段の電圧保持を動作制御するための制御信号が入力される制御電極と、

この制御電極に入力される制御信号に対応して前記電圧保持手段と前記変換トランジスタとの接続をオンオフする第一スイッチング手段と、

前記制御電極に入力される制御信号に対応して前記信号電極と前記変換トランジスタとの接続をオンオフする第二スイッチング手段と、を具備している素子駆動装置。

【請求項８】　可変自在な駆動電流で駆動制御される能動素子と、

所定の駆動電圧が印加される電源電極と、

この電源電極に印加される駆動電圧をゲート電極に印加される制御電圧に対応した駆動電流に変換して前記能動素子に供給する駆動トランジスタと、

前記能動素子を駆動制御するための制御電圧が供給される信号電極と、

前記駆動トランジスタとカレントミラー回路を形成する構造で前記信号電極に供給される制御電圧を自身の電気抵抗により制御電流として入力して制御電圧に変換する変換トランジスタと、

この変換トランジスタにより変換された制御電圧を保持して前記駆動トランジスタのゲート電極に印加する電圧保持手段と、

この電圧保持手段の電圧保持を動作制御するための制御信号が入力される制御電極と、

この制御電極に入力される制御信号に対応して前記電圧保持手段と前記変換トランジスタとの接続をオンオフする第一スイッチング手段と、

前記制御電極に入力される制御信号に対応して前記信号

4

電極と前記変換トランジスタとの接続をオンオフする第二スイッチング手段と、を具備している素子駆動装置。

【請求項９】　（ｍ×ｎ）個の能動素子を可変自在な駆動電流で個々に駆動制御する素子駆動装置であって、

所定の駆動電圧が印加される電源電極と、

この一個の電源電極に印加される駆動電圧を各々のゲート電極に個々に印加される制御電圧に対応した駆動電流に個々に変換して（ｍ×ｎ）個の前記能動素子に個々に供給する（ｍ×ｎ）個の駆動トランジスタと、

（ｍ×ｎ）個の前記能動素子を個々に駆動制御するためのｎ個の制御電圧が各々に順番に供給されるｍ個の信号電極と、

（ｍ×ｎ）個の前記駆動トランジスタの各々とカレントミラー回路を個々に形成する構造でｍ個の前記信号電極の各々に順番に供給されるｎ個の制御電圧を自身の電気抵抗によりｎ個の制御電流として入力して（ｍ×ｎ）個の制御電圧に変換する（ｍ×ｎ）個の変換トランジスタと、

これら（ｍ×ｎ）個の変換トランジスタにより変換された（ｍ×ｎ）個の制御電圧を個々に保持して（ｍ×ｎ）個の前記駆動トランジスタのゲート電極に個々に印加する（ｍ×ｎ）個の電圧保持手段と、

これら（ｍ×ｎ）個の電圧保持手段の電圧保持を個々に動作制御するための制御信号が順番に入力されるｎ個の制御電極と、

これらｎ個の制御電極に順番に入力されるｍ個の制御信号に対応して（ｍ×ｎ）個の前記電圧保持手段と（ｍ×ｎ）個の前記変換トランジスタとの接続を個々にオンオフする（ｍ×ｎ）個の第一スイッチング手段と、

ｎ個の前記制御電極に入力される制御信号に対応してｍ個の前記信号電極と（ｍ×ｎ）個の前記変換トランジスタとの接続を個々にオンオフする（ｍ×ｎ）個の第二スイッチング手段と、を具備している素子駆動装置。

【請求項１０】　可変自在な駆動電流で駆動制御される（ｍ×ｎ）個の能動素子と、

所定の駆動電圧が印加される電源電極と、

この一個の電源電極に印加される駆動電圧を各々のゲート電極に個々に印加される制御電圧に対応した駆動電流に個々に変換して（ｍ×ｎ）個の前記能動素子に個々に供給する（ｍ×ｎ）個の駆動トランジスタと、

（ｍ×ｎ）個の前記能動素子を個々に駆動制御するためのｎ個の制御電圧が各々に順番に供給されるｍ個の信号電極と、

（ｍ×ｎ）個の前記駆動トランジスタの各々とカレントミラー回路を個々に形成する構造でｍ個の前記信号電極の各々に順番に供給されるｎ個の制御電圧を自身の電気抵抗によりｎ個の制御電流として入力して（ｍ×ｎ）個の制御電圧に変換する（ｍ×ｎ）個の変換トランジスタと、

これら（ｍ×ｎ）個の変換トランジスタにより変換された（ｍ×ｎ）個の制御電圧を個々に保持して（ｍ×ｎ）個の前記駆動トランジスタのゲート電極に個々に印加する（ｍ

×ｎ)個の電圧保持手段と、
これら(ｍ×ｎ)個の電圧保持手段の電圧保持を個々に動作制御するための制御信号が順番に入力されるｎ個の制御電極と、
これらｎ個の制御電極に順番に入力されるｍ個の制御信号に対応して(ｍ×ｎ)個の前記電圧保持手段と(ｍ×ｎ)個の前記変換トランジスタとの接続を個々にオンオフする(ｍ×ｎ)個の第一スイッチング手段と、
ｎ個の前記制御電極に入力される制御信号に対応してｍ個の前記信号電極と(ｍ×ｎ)個の前記変換トランジスタとの接続を個々にオンオフする(ｍ×ｎ)個の第二スイッチング手段と、を具備している素子駆動装置。

【請求項１１】　前記能動素子が有機ＥＬ(Electro-Luminescence)素子からなる請求項１ないし１０の何れか一記載の素子駆動装置。

【請求項１２】　前記駆動トランジスタと前記変換トランジスタとの各々がＴＦＴ(Thin Film Transistor)からなり、
前記駆動トランジスタと前記変換トランジスタとのＴＦＴが一個の回路基板の近接した位置に並設されている請求項６ないし１１の何れか一記載の素子駆動装置。

【請求項１３】　前記駆動トランジスタに第一抵抗素子が直列に接続されており、
前記変換トランジスタに第二抵抗素子が直列に接続されている請求項１ないし１２の何れか一記載の素子駆動装置。

【請求項１４】　前記第一第二抵抗素子の各々がドレイン電極とゲート電極とが短絡されたＴＦＴからなる請求項１３記載の素子駆動装置。

【請求項１５】　前記第一抵抗素子と前記第二抵抗素子とのＴＦＴが一個の回路基板の近接した位置に並設されている請求項１４記載の素子駆動装置。

【請求項１６】　前記第一スイッチング手段と前記第二スイッチング手段とがＴＦＴからなる請求項１ないし１５の何れか一記載の素子駆動装置。

【請求項１７】　可変自在な駆動電流で駆動制御される能動素子と、所定の駆動電圧が印加される電源電極と、該電源電極に印加される駆動電圧をゲート電極に印加される制御電圧に対応した駆動電流に変換して前記能動素子に供給する駆動トランジスタと、前記能動素子を駆動制御するための制御電力が供給される信号電極と、該信号電極に供給される制御電力に対応した制御電圧を保持して前記駆動トランジスタのゲート電極に印加する電圧保持手段と、該電圧保持手段の電圧保持を動作制御するための制御信号が入力される制御電極と、を具備している素子駆動装置の素子駆動方法において、
前記信号電極に制御電力として制御電流を供給し、
該信号電極に供給される制御電流を電流変換素子により制御電圧に変換して前記電圧保持手段に保持させ、
前記制御電極に入力される制御信号に対応して前記電圧保持手段と前記電流変換素子との接続をオンオフするとともに前記信号電極と前記電流変換素子との接続もオンオフするようにした素子駆動方法。

【請求項１８】　可変自在な駆動電流で駆動制御される能動素子と、所定の駆動電圧が印加される電源電極と、該電源電極に印加される駆動電圧をゲート電極に印加される制御電圧に対応した駆動電流に変換して前記能動素子に供給する駆動トランジスタと、前記能動素子を駆動制御するための制御電圧が供給される信号電極と、該信号電極に供給される制御電圧を保持して前記駆動トランジスタのゲート電極に印加する電圧保持手段と、該電圧保持手段の電圧保持を動作制御するための制御信号が入力される制御電極と、を具備している素子駆動装置の素子駆動方法であって、
前記信号電極に供給される制御電圧を前記駆動トランジスタとカレントミラー回路を形成する構造の変換トランジスタに電気抵抗で制御電流として入力させて制御電圧に変換させてから前記電圧保持手段に保持させ、
前記制御電極に入力される制御信号に対応して前記電圧保持手段と前記変換トランジスタとの接続をオンオフするとともに前記信号電極と前記変換トランジスタとの接続をオンオフするようにした素子駆動方法。

【請求項１９】　可変自在な駆動電流で駆動制御される能動素子と、所定の駆動電圧が印加される電源電極と、該電源電極に印加される駆動電圧をゲート電極に印加される制御電圧に対応した駆動電流に変換して前記能動素子に供給する駆動トランジスタと、前記能動素子を駆動制御するための制御電力が供給される信号電極と、該信号電極に供給される制御電力に対応した制御電圧を保持して前記駆動トランジスタのゲート電極に印加する電圧保持手段と、該電圧保持手段の電圧保持を動作制御するための制御信号が入力される制御電極と、を具備している素子駆動装置の素子駆動方法において、
前記信号電極に制御電力として制御電流を供給し、
前記信号電極に供給される制御電流を前記駆動トランジスタとカレントミラー回路を形成する構造の変換トランジスタにより制御電圧に変換して前記電圧保持手段に保持させ、
前記制御電極に入力される制御信号に対応して前記電圧保持手段と前記変換トランジスタとの接続をオンオフするとともに前記信号電極と前記変換トランジスタとの接続もオンオフするようにした素子駆動方法。

【請求項２０】　能動素子を可変自在な駆動電流で駆動制御する素子駆動方法であって、
第一第二トランジスタをカレントミラー回路として動作させ、
前記第一トランジスタが前記能動素子を駆動する電流源として動作するように、前記第二トランジスタを駆動する信号を電流値が切換自在な定電流源から供給される電流信号とするようにした素子駆動方法。

7

【請求項２１】　能動素子を可変自在な駆動電流で駆動制御する素子駆動方法であって、
前記能動素子の駆動電流を駆動トランジスタで直接制御し、
前記駆動トランジスタの駆動電圧を制御する信号を電流値が切換自在な定電流源から供給される電流信号とするようにした素子駆動方法。
【請求項２２】　請求項３記載の発明の素子駆動装置と、
ｍ行ｎ列に配列された表示素子からなる（ｍ×ｎ）個の前記能動素子と、を具備している画像表示装置。
【請求項２３】　請求項４記載の発明の素子駆動装置の（ｍ×ｎ）個の前記能動素子がｍ行ｎ列に配列された表示素子からなる画像表示装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、可変自在な駆動電流により能動素子を駆動制御する素子駆動装置と、この素子駆動装置で多数の能動素子を駆動制御する画像表示装置とに関する。
【０００２】
【従来の技術】現在、能動的に動作制御される能動素子が各種装置に利用されており、例えば、画像表示装置では能動素子として発光素子などの表示素子が利用されている。この発光素子としてはＥＬ素子などがあり、このＥＬ素子としては無機素子と有機素子とがある。
【０００３】無機ＥＬ素子は、省電力で均一な面発光を実現できるとして、例えば、液晶ディスプレイのバックライトなどとして実用化されている。一方、有機ＥＬ素子は、開発から日が浅く耐久性などの研究課題を有するが、低電圧の直流電流で駆動することができ、高輝度を高効率に実現することかでき、応答性も良好であるなどの特性を具備するため実用化が要望されている。有機ＥＬ素子は上述のように電流で駆動制御されるため、電圧で駆動制御される従来の無機ＥＬ素子とは素子駆動装置の構造も相違することになる。
【０００４】例えば、特開平８－５４８３５号公報には、有機ＥＬ素子などの電流制御型の発光素子をアクティブマトリクス方式で駆動する素子駆動装置が開示されている。しかし、この素子駆動装置では、有機ＥＬ素子の階調を複数のトランジスタのオンオフで制御するため、多階調を表現するためにはトランジスタの個数が膨大となり実用的でない。
【０００５】また、特開平５－７４５６９号公報には、無機ＥＬ素子を電圧駆動する素子駆動装置が開示されている。上記公報の素子駆動装置では、所定の駆動電圧が印加される電源電極が無機ＥＬ素子にＴＦＴを介して接続されており、このＴＦＴにより電源電極に印加される駆動電圧をゲート電極に印加される制御電圧に対応した駆動電流に変換して無機ＥＬ素子に供給する。

8

【０００６】この電流の供給量を制御するため、ＴＦＴのゲート電極に電圧保持手段が接続されており、この電圧保持手段に保持させる電圧を制御することで無機ＥＬ素子の発光輝度を制御するので、前述した特開平８－５４８３５号公報の装置のように、素子単位の階調数を増加させるためにトランジスタの個数を増大させる必要もない。
【０００７】そこで、このような構造の素子駆動装置を電流制御型の能動素子である有機ＥＬ素子に応用した素子駆動装置を一従来例として図１５を参照して以下に説明する。なお、同図は一従来例の素子駆動装置を示す回路図である。
【０００８】ここで一従来例として例示する素子駆動装置１は、能動素子として有機ＥＬ素子２を具備しており、一対の電源電極として電源線３と接地線４とを具備している。電源線３には所定の駆動電圧が印加されており、接地線４は接地されている。
【０００９】有機ＥＬ素子２は、電源線３には直接に接続されているが、接地線４にはＴＦＴ５を介して接続されている。このＴＦＴ５は、電源線３から接地線４に印加される駆動電圧をゲート電極に印加される制御電圧に対応した駆動電流に変換して有機ＥＬ素子２に供給する。
【００１０】ＴＦＴ５のゲート電極には、電圧保持手段として保持コンデンサ６が接続されており、この保持コンデンサ６も接地線４に接続されている。また、この保持コンデンサ６およびＴＦＴ５のゲート電極には、スイッチング手段であるスイッチング素子７を介して信号電極である信号線８が接続されており、このスイッチング素子７の制御端子には、制御電極である制御線９が接続されている。
【００１１】保持コンデンサ６は、制御電圧を保持してＴＦＴ５のゲート電極に印加し、スイッチング素子７は、保持コンデンサ６と信号線８との接続をオンオフする。信号線８には、有機ＥＬ素子２の発光輝度を駆動制御するための制御電圧が供給され、制御線９には、スイッチング素子７を動作制御するための制御信号が入力される。
【００１２】上述のような構造の素子駆動装置１は、有機ＥＬ素子２を可変自在な発光輝度で駆動制御することができる。その場合、制御線９に制御信号を入力してスイッチング素子７をオン状態に動作制御し、この状態で信号線８から有機ＥＬ素子２の発光輝度に対応した制御電圧を保持コンデンサ６に供給して保持させる。
【００１３】この保持コンデンサ６が保持した制御電圧はＴＦＴ５のゲート電極に印加されるので、電源線３に常時印加されている駆動電圧がＴＦＴ５によりゲート電圧に対応した駆動電流に変換されて有機ＥＬ素子２に供給されることになり、この状態は制御線９の制御信号によりスイッチング素子７がオフ状態に動作制御されても

継続される。

【００１４】電源線３の駆動電圧からＴＦＴ５により変換されて有機ＥＬ素子２に供給される駆動電流は、保持コンデンサ６からＴＦＴ５のゲート電極に印加される電圧に対応するので、有機ＥＬ素子２は信号線８に供給された制御電圧に対応した輝度で発光することになる。

【００１５】上述のような素子駆動装置１は、実際には画像表示装置として利用することが想定されている。その場合、(ｍ×ｎ)個の有機ＥＬ素子２をｍ行ｎ列に配列し、ｍ個の信号線８とｎ個の制御線９とに制御電圧と制御信号とをマトリクス入力して(ｍ×ｎ)個の保持コンデンサ６に制御電圧を個々に保持させる。

【００１６】これで一個の電源線３の駆動電圧が(ｍ×ｎ)個のＴＦＴ５により(ｍ×ｎ)個の保持コンデンサ６の保持電圧に対応した駆動電流として(ｍ×ｎ)個の有機ＥＬ素子２に個々に印加されるので、これらの有機ＥＬ素子２を個々に相違する輝度で発光させて画素単位で階調表現されたドットマトリクスの画像を表示することができる。

【００１７】

【発明が解決しようとする課題】上述のような素子駆動装置１では、有機ＥＬ素子２に可変自在に供給する駆動電流をＴＦＴ５により電源線３に供給される駆動電圧から生成することができる。このＴＦＴ５が駆動電圧から生成する駆動電流は保持コンデンサ６の保持電圧により制御することができ、この保持コンデンサ６の保持電圧は信号線８に供給する制御電圧により制御することができる。

【００１８】しかし、実際に素子駆動装置１を利用して前述のような画像表示装置を製造した場合、ｍ個の信号線８には(ｍ×ｎ)個の有機ＥＬ素子２がｎ個ずつ接続されることになる。そこで、高精細な画像表示装置を形成するために微細構造の信号線８に多数の有機ＥＬ素子２を接続すると、信号線８での電圧降下により有機ＥＬ素子２に供給される駆動電圧が変動することになる。

【００１９】また、微細構造の多数のＴＦＴ５の動作特性が製造誤差のために一定しないと、保持コンデンサ６に所望の制御電圧を保持させて電源線３に駆動電圧を供給しても、有機ＥＬ素子２に供給される駆動電流は制御電圧に対応しないことになる。

【００２０】上述のような場合、素子駆動装置１の有機ＥＬ素子２が所望の輝度で発光しないことになるので、素子駆動装置１を利用した画像表示装置による階調画像の表示品質が低下することになる。

【００２１】本発明は上述のような課題に鑑みてなされたものであり、有機ＥＬ素子などの能動素子を所望の状態に動作制御できる素子駆動装置と、この素子駆動装置を利用して多数の能動素子で画像を表示する画像表示装置と、を提供することを目的とする。

【００２２】

【課題を解決するための手段】本発明の一の素子駆動装置では、制御電極に入力される制御信号により第一第二スイッチング手段がオン状態とされると、第二スイッチング手段を介して信号電極から入力される制御電流が変換トランジスタにより制御電圧に変換され、この制御電圧が第一スイッチング手段を介して電圧保持手段に保持される。この電圧保持手段に保持されてゲート電極に印加される制御電圧に対応して駆動トランジスタが電源電極の駆動電圧を駆動電流に変換するので、この駆動電流が供給される能動素子は信号電極に入力された制御電流に対応して動作制御されることになり、この動作状態は第一第二スイッチング手段がオフ状態とされても電圧保持手段の電圧保持により継続される。能動素子を動作制御するために信号電極には制御電圧でなく制御電流が入力されるので、一個の信号電極に多数の能動素子が接続されるような構造でも、電圧降下による能動素子の動作格差が発生しない。駆動トランジスタと変換トランジスタとがカレントミラー回路を形成するため、駆動トランジスタが製造誤差のために所望の動作特性を発揮しなくとも、変換トランジスタが同様な製造誤差により動作特性が同等に変動していれば、駆動トランジスタが駆動電圧から変換する駆動電流は変換トランジスタに供給される制御電流に対応することになり、能動素子には信号電極の制御電流に対応した駆動電流が供給される。

【００２３】また、本発明の他の素子駆動装置では、ｎ個の制御電極に順番に入力される制御信号により(ｍ×ｎ)個の第一第二スイッチング手段がｍ個ずつオン状態とされると、ｍ個ずつオン状態とされる(ｍ×ｎ)個の第二スイッチング手段を介してｍ個の信号電極から順番に入力されるｎ個の制御電流が(ｍ×ｎ)個の変換トランジスタにより(ｍ×ｎ)個の制御電圧に順番に変換されるので、この(ｍ×ｎ)個の制御電圧がｍ個ずつオン状態とされる(ｍ×ｎ)個の第一スイッチング手段を介して(ｍ×ｎ)個の電圧保持手段に順番に保持される。この(ｍ×ｎ)個の電圧保持手段の個々の保持電圧に対応して(ｍ×ｎ)個の駆動トランジスタが一個の電源電極の駆動電圧を駆動電流に個々に変換するので、この(ｍ×ｎ)個の駆動電流が個々に供給される(ｍ×ｎ)個の能動素子は信号電極に入力された制御電流に対応して個々に動作制御されることになり、この動作状態は第一第二スイッチング手段がオフ状態とされても電圧保持手段の電圧保持により継続される。(ｍ×ｎ)個の能動素子を動作制御するためにｍ個の信号電極には制御電圧でなく制御電流が入力されるので、ｍ個の信号電極に多数の(ｍ×ｎ)個の能動素子がｎ個ずつ接続された構造でも、電圧降下による(ｍ×ｎ)個の能動素子の動作格差が発生しない。駆動トランジスタと変換トランジスタとがカレントミラー回路を形成するため、駆動トランジスタが製造誤差のために所望の動作特性を発揮しなくとも、変換トランジスタが同様な製造誤差により動作特性が同等に変動していれ

ば、駆動トランジスタが駆動電圧から変換する駆動電流は変換トランジスタに供給される制御電流に対応することになり、能動素子には信号電極の制御電流に対応した駆動電流が供給される。

【００２４】ただし、上述のような素子駆動装置において、変換トランジスタは制御電圧を制御電流に変換できれば良いので、例えば、これを抵抗素子とすることも可能である。この場合、抵抗素子と駆動トランジスタとはカレントミラー回路を形成しないので、信号電極から抵抗素子に供給される制御電流と駆動トランジスタが駆動電圧から変換する駆動電流との対応の精度は低下するが、それでも能動素子には信号電極の制御電流に対応した駆動電流が供給されることになり、信号電極に制御電圧を印加した場合の電圧降下が駆動電流に影響することはない。

【００２５】また、上述のような素子駆動装置において、駆動トランジスタとカレントミラー回路を形成する変換トランジスタに、信号電極から制御電流でなく制御電圧を印加することも可能である。この場合、信号電極から変換トランジスタに入力される制御電圧は、変換トランジスタに自身の電気抵抗により制御電流として入力されるので、これが制御電圧に変換されて電圧保持手段に保持される。信号電極の制御電圧には電圧降下が発生するが、駆動トランジスタと変換トランジスタとがカレントミラー回路を形成するので、駆動トランジスタと変換トランジスタとの製造誤差による駆動電流の変動は防止される。

【００２６】さらに、上述のような素子駆動装置における他の発明としては、前記能動素子が有機ＥＬ素子からなる。従って、能動素子である有機ＥＬ素子が信号電極に入力された制御電流に対応した輝度で発光することになる。

【００２７】また、上述のような素子駆動装置における他の発明としては、前記駆動トランジスタと前記変換トランジスタとの各々がＴＦＴからなり、前記駆動トランジスタと前記変換トランジスタとのＴＦＴが一個の回路基板の近接した位置に並設されている。

【００２８】従って、駆動トランジスタと変換トランジスタとの動作特性は同様な製造誤差により同等に変動するので、駆動トランジスタが駆動電圧から変換する駆動電流は変換トランジスタに供給される制御電流に対応することになり、能動素子には信号電極の制御電流に対応した駆動電流が供給される。

【００２９】さらに、上述のような素子駆動装置における他の発明としては、前記駆動トランジスタに第一抵抗素子が直列に接続されており、前記変換トランジスタに第二抵抗素子が直列に接続されている。

【００３０】従って、駆動トランジスタの電圧変動に対する電流変化の割合が直列に接続された第一抵抗素子により低減されることになり、電源電極の駆動電圧の変動による能動素子の駆動電流の変化の割合が低減される。このような第一抵抗素子に対して第二抵抗素子が変換トランジスタにも同様に接続されているので、駆動トランジスタと変換トランジスタとのカレントミラー回路としての動作は良好に維持される。

【００３１】また、上述のような素子駆動装置における他の発明としては、前記第一第二抵抗素子の各々がドレイン電極とゲート電極とが短絡されたＴＦＴからなる。従って、第一第二抵抗素子の各々がドレイン電極とゲート電極とが短絡されたＴＦＴからなるので、これらは抵抗素子として機能することになる。例えば、駆動トランジスタと変換トランジスタともＴＦＴからなる場合、これらと第一第二抵抗素子のＴＦＴとが同一工程で製造される。

【００３２】さらに、上述のような素子駆動装置における他の発明としては、前記第一抵抗素子と前記第二抵抗素子とのＴＦＴが一個の回路基板の近接した位置に並設されている。従って、第一第二抵抗素子の抵抗特性は同様な製造誤差により同等に変動するので、駆動トランジスタと変換トランジスタとのカレントミラー回路としての動作が良好に維持される。

【００３３】また、上述のような素子駆動装置における他の発明としては、前記第一スイッチング手段と前記第二スイッチング手段とがＴＦＴからなる。従って、駆動トランジスタと変換トランジスタとや第一第二抵抗素子がＴＦＴからなる場合、これらと第一第二スイッチング手段のＴＦＴとが同一工程で製造される。

【００３４】本発明の一の画像表示装置は、本発明の素子駆動装置と、m行ｎ列に配列された表示素子からなる(m×ｎ)個の前記能動素子と、を具備している。

【００３５】従って、本発明の画像表示装置では、m行ｎ列に配列された表示素子からなる(m×ｎ)個の能動素子が、本発明の素子駆動装置により個々に相違する表示状態に駆動されるので、画素単位で階調表現されたドットマトリクスの画像が表示される。本発明の素子駆動装置では、信号電極の制御電流に良好に対応した駆動電流が能動素子に供給されるので、本発明の画像表示装置では、画素が個々に適正な階調濃度で表示動作を実行する。

【００３６】本発明の他の画像表示装置は、本発明の素子駆動装置の(m×ｎ)個の前記能動素子がm行ｎ列に配列された表示素子からなる。

【００３７】従って、本発明の画像表示装置では、本発明の素子駆動装置の(m×ｎ)個の能動素子が、m行ｎ列に配列された表示素子として個々に相違する表示状態に駆動されるので、画素単位で階調表現されたドットマトリクスの画像が表示される。本発明の素子駆動装置では、信号電極の制御電流に良好に対応した駆動電流が能動素子に供給されるので、本発明の画像表示装置では、画素が個々に適正な階調濃度で表示動作を実行する。

【００３８】
【発明の実施の形態】本発明の実施の第一の形態を図１および図２を参照して以下に説明する。ただし、本実施の形態に関して前述した一従来例と同一の部分は、同一の名称を使用して詳細な説明は省略する。なお、図１は本実施の形態の素子駆動装置の回路構造を示す回路図、図２はＴＦＴの薄膜構造を示す平面図である。
【００３９】本実施の形態の素子駆動装置１１は、図１に示すように、一従来例の素子駆動装置１と同様に、能動素子として有機ＥＬ素子１２を具備しており、一対の電源電極として電源線１３と接地線１４とを具備している。電源線１３には所定の駆動電圧が印加されており、接地線１４は接地されている。
【００４０】有機ＥＬ素子１２は、電源線１３には直接に接続されており、接地線１４にはポリシリコン製のｎチャネルのＭＯＳ(Metal Oxide Semiconductor)ＦＥＴ(Field Effect Transistor)からなる駆動ＴＦＴ１５を介して接続されている。この駆動ＴＦＴ１５は、電源線１３から接地線１４に印加される駆動電圧をゲート電極に印加される制御電圧に対応した駆動電流に変換して有機ＥＬ素子１２に供給する。
【００４１】駆動ＴＦＴ１５のゲート電極には、電圧保持手段として保持コンデンサ１６が接続されており、この保持コンデンサ１６も接地線１４に接続されている。この保持コンデンサ１６および駆動ＴＦＴ１５のゲート電極には、スイッチング手段である第一スイッチング素子１７の一端が接続されているが、一従来例の素子駆動装置１とは相違して、この第一スイッチング素子１７の他端には、電流変換素子として変換トランジスタである変換ＴＦＴ１８が接続されている。
【００４２】この変換ＴＦＴ１８は、図２に示すように、駆動ＴＦＴ１５と同一構造に形成されており、一個の回路基板１９の駆動ＴＦＴ１５に近接した位置に並設されている。この変換ＴＦＴ１８も駆動ＴＦＴ１５と同様に接地線１４に接続されており、これらのＴＦＴ１５，１８により第一スイッチング素子１７を介してカレントミラー回路が形成されている。
【００４３】変換ＴＦＴ１８には、第二スイッチング手段である第二スイッチング素子２０を介して信号電極である信号線２１が接続されており、この第二スイッチング素子２０の制御端子にも第一スイッチング素子１７と同様に制御電極である制御線２２が接続されている。図２に示すように、第一第二スイッチング素子１７，２０も、駆動／変換ＴＦＴ１５，１８と同様な構造のＴＦＴで形成されており、一個の回路基板１９の表面に並設されている。
【００４４】本実施の形態の素子駆動装置１１では、一従来例として前述した素子駆動装置１とは相違して、信号線２１に有機ＥＬ素子１２の発光輝度を駆動制御するための制御信号が、可変自在な制御電圧でなく可変自在な制御電流として供給される。
【００４５】制御線２２には、第一スイッチング素子１７と第二スイッチング素子２０とを動作制御するための制御信号が入力され、第二スイッチング素子２０は、信号線２１と変換ＴＦＴ１８との接続をオンオフし、第一スイッチング素子１７は、変換ＴＦＴ１８と保持コンデンサ１６との接続をオンオフする。
【００４６】この変換ＴＦＴ１８は、第二スイッチング素子２０を介して信号線２１から入力される制御電流を制御電圧に変換し、保持コンデンサ１６は、第一スイッチング素子１７を介して変換ＴＦＴ１８から入力される制御電圧を保持して駆動ＴＦＴ１５のゲート電極に印加する。
【００４７】本実施の形態の素子駆動装置１１も、図３に示すように、実際には画像表示装置１０００の一部として利用されており、本実施の形態の画像表示装置１０００では、一個の回路基板１９に(ｍ×ｎ)個の有機ＥＬ素子１２がｍ行ｎ列に配列されて形成されている。
【００４８】ｍ個の電源線１３は相互に接続されて一個とされており、一個の直流電源１００１が接続されている。ｍ個の接地線１４も相互に接続されて一個とされており、本体ハウジング（図示せず）などの大容量部品に接続されることで接地されている。
【００４９】ｍ個の信号線２１の各々には、制御電流を各々発生するｍ個の電流ドライバ１００２が個々に接続されており、ｎ個の制御線２２の各々には、制御信号を各々発生するｎ個の信号ドライバ１００３が個々に接続されている。これらのドライバ１００２，１００３の全部が一個の統合制御回路（図示せず）に接続されており、この統合制御回路がｍ個の電流ドライバ１００２とｎ個の信号ドライバ１００３とのマトリクス駆動を統合制御する。
【００５０】ｍ個の電流ドライバ１００２の各々は、図４に示すように、電圧発生回路１００４と電流変換回路１００５とを個々に具備しており、これらの回路１００４，１００５が相互に接続されている。ｍ個の電圧発生回路１００４の各々には、一個の直流電源１００１と一個の統合制御回路とが接続されており、ｍ個の電流変換回路１００５の各々が、ｍ個の信号線２１に個々に接続されている。
【００５１】電圧発生回路１００４は、統合制御回路の動作制御により直流電源１００１が発生する定電圧から各行のｎ個の有機ＥＬ素子１２の輝度に対応した電圧を順番に生成し、電流変換回路１００５は、電圧発生回路１００４の発生電圧を“０～２(μＡ)”の信号電流に変換してｍ個の信号線２１に個々に出力する。
【００５２】上述のような構成において、本実施の形態の素子駆動装置１１も、有機ＥＬ素子１２を可変自在な発光輝度で駆動制御することができる。その場合、制御線２２に制御信号を入力して第一第二スイッチング素子

１７，２０をオン状態に動作制御し、この状態で信号線２１に有機ＥＬ素子１２の発光輝度に対応した制御電流を入力する。

【００５３】すると、この制御電流は第二スイッチング素子２０を介して変換ＴＦＴ１８に入力されて制御電圧に変換され、この制御電圧は第一スイッチング素子１７を介して保持コンデンサ１６に保持される。この保持コンデンサ１６の保持電圧は駆動ＴＦＴ１５のゲート電極に印加されるので、電源線１３に常時印加されている駆動電圧が駆動ＴＦＴ１５により駆動電流に変換されて有機ＥＬ素子１２に供給される。

【００５４】その電流量は保持コンデンサ１６から駆動ＴＦＴ１５のゲート電極に印加される電圧に対応するので、有機ＥＬ素子１２は信号線２１に供給された制御電流に対応した輝度で発光することになり、この動作状態は第一第二スイッチング素子１７，２０がオフ状態とされても保持コンデンサ１６の保持電圧により維持される。

【００５５】そこで、本実施の形態の素子駆動装置１１を利用した画像表示装置１０００では、縦横に配列された(ｍ×ｎ)個の有機ＥＬ素子１２が個々に制御された輝度で発光するので、これで画素単位で階調表現されたドットマトリクスの画像を表示することができる。

【００５６】本実施の形態の素子駆動装置１１では、前述のように有機ＥＬ素子１２の発光輝度を制御するための制御信号を、制御電圧でなく制御電流として信号線２１に入力する。このため、高精細な画像表示装置１０００を形成するために微細構造の信号線２１に多数の有機ＥＬ素子１２を接続した構造でも、信号線２１の電圧降下により有機ＥＬ素子１２の駆動電流に格差が発生することがない。

【００５７】しかも、本実施の形態の素子駆動装置１１では、駆動ＴＦＴ１５と変換ＴＦＴ１８とがカレントミラー回路を形成するため、駆動ＴＦＴ１５が製造誤差のために所望の動作特性を発揮しなくとも、変換ＴＦＴ１８が同様な製造誤差により動作特性が同等に変動していれば、駆動ＴＦＴ１５が駆動電圧から変換する駆動電流は変換ＴＦＴ１８に供給される制御電流に対応することになる。

【００５８】このため、本実施の形態の素子駆動装置１１では、信号線２１の制御電流に正確に対応した駆動電流を有機ＥＬ素子１２に供給することができるので、本実施の形態の素子駆動装置１１を利用した画像表示装置１０００は、画素単位で階調された画像を良好な品質で表示することができる。

【００５９】特に、本実施の形態の素子駆動装置１１では、図２に示すように、カレントミラー回路を形成する駆動／変換ＴＦＴ１５，１８が一個の回路基板１９の近接した位置に並設されているので、駆動／変換ＴＦＴ１５，１８の製造誤差を同様として動作特性を同等とすることができる。

【００６０】また、本実施の形態の素子駆動装置１１では、第一第二スイッチング素子１７，２０もＴＦＴからなるので、これらの第一第二スイッチング素子１７，２０を駆動／変換ＴＦＴ１５，１８と同一工程で製造することができ、第一第二スイッチング素子１７，２０を形成する専用の工程を必要としないので生産性が良好である。

【００６１】なお、本発明は上記形態に限定されるものではなく、その要旨を逸脱しない範囲で各種の変形を許容する。例えば、上記形態では能動素子として有機ＥＬ素子１２を利用することを例示したが、本発明は可変自在な駆動電流で駆動制御されるＬＥＤ(Light Emitting Diode)やＬＤ(Laser Diode)などの各種の能動素子に適用することができる。

【００６２】また、上記形態では素子駆動装置１１をマトリクス状に縦横に配列して画像表示装置１０００を形成することを例示したが、例えば、素子駆動装置を一列に配列して電子写真装置のラインヘッドを形成するようなことも可能である。さらに、上記形態では薄膜技術で微細構造の素子駆動装置１１を形成することを例示したが、例えば、巨大な画像表示装置に対応するためにチップ部品で素子駆動装置を組み立てるようなことも可能である。

【００６３】また、上記形態では素子駆動装置１１が能動素子である有機ＥＬ素子１２を一部として具備することを例示したが、例えば、能動素子が配列された表示パネルと素子駆動装置である回路パネルとを別体で形成して接合することも可能である。

【００６４】さらに、上記形態では駆動／変換ＴＦＴ１５，１８をｎチャネル構造として有機ＥＬ素子１２と接地線１４との中間に駆動ＴＦＴ１５を形成することを例示したが、図５に第一の変形例として例示する素子駆動装置３１のように、駆動／変換ＴＦＴ３２，３３をｐチャネル構造として有機ＥＬ素子１２と電源線１３との中間に駆動ＴＦＴ３２を形成することも可能である。

【００６５】ただし、ｎチャネル構造のＴＦＴ１５，１８は、ｐチャネル構造のＴＦＴ３２，３３に比較して占有面積が略半分であるため、装置の小型軽量化や有機ＥＬ素子１２の大面積化のためにはｎチャネル構造のＴＦＴ１５，１８を採用することが好ましい。

【００６６】また、上記形態では制御電流を制御電圧に変換する電流変換素子として変換トランジスタである変換ＴＦＴ１８を具備することを例示したが、図６に第二の変形例として例示する素子駆動装置３５のように、この電流変換素子として抵抗素子３６を利用することも可能である。

【００６７】この場合、抵抗素子３６と駆動ＴＦＴ１５とでカレントミラー回路は形成されないので、制御電流と駆動電流との対応の精度は低下するが、それでも信号

線２１には制御電圧でなく制御電流が供給されるので、電圧降下による有機ＥＬ素子１２の発光輝度の格差は防止することができる。

【００６８】また、上記形態では信号線２１に制御電圧でなく制御電流が供給されることを例示したが、これを制御電圧としても変換／駆動ＴＦＴ１８，１５とでカレントミラー回路は形成されるので、制御電圧と駆動電流とを良好に対応させることができる。

【００６９】なお、この場合は制御電圧が変換ＴＦＴ１８に自身の電気抵抗により制御電流として入力されることになり、この制御電流を変換ＴＦＴ１８が制御電圧に変換することになる。変換ＴＦＴ１８のＭＯＳ抵抗は製造誤差が微小なので、変換ＴＦＴ１８の製造誤差による制御電流の格差は微小である。

【００７０】また、上記形態では電圧を保持して駆動ＴＦＴ１５のゲート電極に印加する電圧保持手段として単体の部品からなる保持コンデンサ１６を設けることを例示したが、例えば、駆動ＴＦＴ１５のゲート電極を自身の容量により電圧を保持する電圧保持手段とすることも可能である。

【００７１】つぎに、本発明の実施の第二の形態を図７を参照して以下に説明する。ただし、この実施の第二の形態において前述した第一の形態と同一の部分は、同一の名称および符号を使用して詳細な説明は省略する。なお、図面は実施の第二の形態の素子駆動装置を示す回路図である。

【００７２】本実施の形態の素子駆動装置４１では、駆動ＴＦＴ１５に第一抵抗素子４２が直列に接続されており、変換ＴＦＴ１８に第二抵抗素子４３が直列に接続されている。これらの第一第二抵抗素子４２，４３は、例えば、導電性の薄膜からなり、第一第二抵抗素子４２，４３は同一の抵抗値に形成されている。

【００７３】上述のような構成において、本実施の形態の素子駆動装置４１は、前述した第一の形態の素子駆動装置１１と同様に機能する。ただし、本実施の形態の素子駆動装置４１では、駆動／変換ＴＦＴ１５に第一抵抗素子４２が直列に接続されているので、駆動ＴＦＴ１５の電圧変動に対する電流変化の割合が第一抵抗素子４２により低減されている。

【００７４】このため、本実施の形態の素子駆動装置４１は、電源線１３の駆動電圧の変動に対して有機ＥＬ素子１２の駆動電流の変化が低減されるので、有機ＥＬ素子１２を所望の輝度で良好に発光させることができ、画像表示装置を形成した場合の表示品質を向上させることができる。

【００７５】なお、上述のような素子駆動装置４１において、第一第二抵抗素子４２，４３も一個の回路基板１９の表面の近接した位置に並設すれば、第一第二抵抗素子４２，４３の製造誤差による抵抗特性の変動を同等とすることができるので、第一第二抵抗素子４２，４３による駆動／変換ＴＦＴ１５，１８の特性補正を同等としてカレントミラー回路を良好に動作させることができる。

【００７６】なお、図８に示すように、上述の第一第二抵抗素子４２，４３を前述のｐチャネルの駆動／変換ＴＦＴ３２，３３に接続した素子駆動装置５１も当然ながら実施可能である。

【００７７】また、図９に示す素子駆動装置６１のように、ドレイン電極とゲート電極とが短絡されたＴＦＴで第一第二抵抗素子６２，６３を形成することも可能である。この場合、これらのＴＦＴが抵抗素子として機能するので、素子駆動装置６１も上述の素子駆動装置４１と同様に機能することができる。

【００７８】しかも、このようにＴＦＴからなる第一第二抵抗素子６２，６３は、駆動／変換ＴＦＴ１５，１８と同一工程で形成できるので、素子駆動装置６１は生産性が良好である。また、この第一第二抵抗素子６２，６３のＴＦＴも一個の回路基板１９の表面の近接した位置に並設すれば、その製造誤差による抵抗特性の変動を同等として駆動／変換ＴＦＴ１５，１８からなるカレントミラー回路を良好に動作させることができる。

【００７９】なお、図１０に示す素子駆動装置７１のように、ｐチャネルの駆動／変換ＴＦＴ３２，３３にｐチャネルのＴＦＴからなる第一第二抵抗素子７２，７３を接続することも可能である。

【００８０】また、図１１に示す素子駆動装置８１のように、駆動トランジスタを並列に接続された複数のＴＦＴ15_1～15_3で形成して各々に複数の第一抵抗素子42_1～42_3を一つずつ接続することも可能である。この場合、カレントミラー回路として機能する駆動ＴＦＴ15_1～15_3と変換ＴＦＴ１８とに通電される電流の比率が三対一となるので、微少な制御電流で多大な駆動電流を有機ＥＬ素子１２に供給することができる。

【００８１】ただし、ここでは説明を簡略化するために駆動トランジスタを並列に接続された複数のＴＦＴ15_1～15_3として説明しているが、これは等価回路なので実際には複数のＴＦＴ15_1～15_3は変換ＴＦＴ１８の三倍の面積の一個のＴＦＴとして形成することができ、同様に抵抗素子42_1～42_3も一個の抵抗素子として形成することができる。

【００８２】なお、上述のようにカレントミラー回路の電流比を設定した構造で第一第二抵抗素子を省略することも可能であり、図１２に示す素子駆動装置９１のように、ｐチャネルの駆動／変換ＴＦＴ32_1～32_3，３３でカレントミラー回路の電流比を設定することも可能である。

【００８３】また、図１３に示す素子駆動装置１０１のように、カレントミラー回路の電流比を設定した構造で第一第二抵抗素子62_1～62_3，６３をＴＦＴで形成することも可能であり、図１４に示す素子駆動装置１１１

のように、カレントミラー回路の電流比を設定した構造で第一第二抵抗素子７２$_1$～７２$_3$，７３をｐチャネルのＴＦＴで形成することも可能である。

【００８４】

【発明の効果】本発明は以上説明したように構成されているので、以下に記載するような効果を奏する。

【００８５】請求項１記載の発明の素子駆動装置は、能動素子を可変自在な駆動電流で駆動制御する素子駆動装置であって、所定の駆動電圧が印加される電源電極と、この電源電極に印加される駆動電圧をゲート電極に印加される制御電圧に対応した駆動電流に変換して前記能動素子に供給する駆動トランジスタと、前記能動素子を駆動制御するための制御電流が供給される信号電極と、該信号電極に供給される制御電流を制御電圧に変換する電流変換素子と、この電流変換素子により変換された制御電圧を保持して前記駆動トランジスタのゲート電極に印加する電圧保持手段と、この電圧保持手段の電圧保持を動作制御するための制御信号が入力される制御電極と、この制御電極に入力される制御信号に対応して前記電圧保持手段と前記電流変換素子との接続をオンオフする第一スイッチング手段と、前記制御電極に入力される制御信号に対応して前記信号電極と前記電流変換素子との接続をオンオフする第二スイッチング手段とを具備していることにより、能動素子を動作制御するために信号電極に制御電圧でなく制御電流が入力されるので、一個の信号電極に多数の能動素子が接続されるような構造でも電圧降下による能動素子の動作格差を防止することができ、信号電極の制御電流に対応した駆動電流を能動素子に供給することができるので、能動素子を所望の状態に動作制御することができる。

【００８６】請求項２記載の発明の素子駆動装置は、可変自在な駆動電流で駆動制御される能動素子と、所定の駆動電圧が印加される電源電極と、この電源電極に印加される駆動電圧をゲート電極に印加される制御電圧に対応した駆動電流に変換して前記能動素子に供給する駆動トランジスタと、前記能動素子を駆動制御するための制御電流が供給される信号電極と、該信号電極に供給される制御電流を制御電圧に変換する電流変換素子と、この電流変換素子により変換された制御電圧を保持して前記駆動トランジスタのゲート電極に印加する電圧保持手段と、この電圧保持手段の電圧保持を動作制御するための制御信号が入力される制御電極と、この制御電極に入力される制御信号に対応して前記電圧保持手段と前記電流変換素子との接続をオンオフする第一スイッチング手段と、前記制御電極に入力される制御信号に対応して前記信号電極と前記電流変換素子との接続をオンオフする第二スイッチング手段とを具備していることにより、能動素子を動作制御するために信号電極に制御電圧でなく制御電流が入力されるので、一個の信号電極に多数の能動素子が接続されるような構造でも電圧降下による能動素子の動作格差を防止することができ、信号電極の制御電流に対応した駆動電流を能動素子に供給することができるので、能動素子を所望の状態に動作制御することができる。

【００８７】請求項３記載の発明の素子駆動装置は、(ｍ×ｎ)個の能動素子を可変自在な駆動電流で個々に駆動制御する素子駆動装置であって、所定の駆動電圧が印加される電源電極と、この一個の電源電極に印加される駆動電圧を各々のゲート電極に個々に印加される制御電圧に対応した駆動電流に個々に変換して(ｍ×ｎ)個の前記能動素子に個々に供給する(ｍ×ｎ)個の駆動トランジスタと、(ｍ×ｎ)個の前記能動素子を個々に駆動制御するためのｎ個の制御電流が各々に順番に供給されるｍ個の信号電極と、これらｍ個の信号電極の各々に順番に供給されるｎ個の制御電流を(ｍ×ｎ)個の制御電圧に変換する(ｍ×ｎ)個の電流変換素子と、これら(ｍ×ｎ)個の電流変換素子により変換された(ｍ×ｎ)個の制御電圧を個々に保持して(ｍ×ｎ)個の前記駆動トランジスタのゲート電極に個々に印加する(ｍ×ｎ)個の電圧保持手段と、これら(ｍ×ｎ)個の電圧保持手段の電圧保持を個々に動作制御するための制御信号が順番に入力されるｎ個の制御電極と、これらｎ個の制御電極に順番に入力されるｍ個の制御信号に対応して(ｍ×ｎ)個の前記電圧保持手段と(ｍ×ｎ)個の前記電流変換素子との接続を個々にオンオフする(ｍ×ｎ)個の第一スイッチング手段と、ｎ個の前記制御電極に入力される制御信号に対応してｍ個の前記信号電極と(ｍ×ｎ)個の前記電流変換素子との接続を個々にオンオフする(ｍ×ｎ)個の第二スイッチング手段とを具備していることにより、多数の能動素子を動作制御するために信号電極に制御電圧でなく制御電流が入力されるので、信号電極の電圧降下による多数の能動素子の動作格差を防止することができ、信号電極の制御電流に対応した駆動電流を能動素子に供給することができるので、多数の能動素子を所望の状態に動作制御することができる。

【００８８】請求項４記載の発明の素子駆動装置は、可変自在な駆動電流で駆動制御される(ｍ×ｎ)個の能動素子と、所定の駆動電圧が印加される電源電極と、この一個の電源電極に印加される駆動電圧を各々のゲート電極に個々に印加される制御電圧に対応した駆動電流に個々に変換して(ｍ×ｎ)個の前記能動素子に個々に供給する(ｍ×ｎ)個の駆動トランジスタと、(ｍ×ｎ)個の前記能動素子を個々に駆動制御するためのｎ個の制御電流が各々に順番に供給されるｍ個の信号電極と、これらｍ個の信号電極の各々に順番に供給されるｎ個の制御電流を(ｍ×ｎ)個の制御電圧に変換する(ｍ×ｎ)個の電流変換素子と、これら(ｍ×ｎ)個の電流変換素子により変換された(ｍ×ｎ)個の制御電圧を個々に保持して(ｍ×ｎ)個の前記駆動トランジスタのゲート電極に個々に印加する(ｍ×ｎ)個の電圧保持手段と、これら(ｍ×ｎ)個の電圧

保持手段の電圧保持を個々に動作制御するための制御信号が順番に入力されるｎ個の制御電極と、これらｎ個の制御電極に順番に入力されるｍ個の制御信号に対応して（ｍ×ｎ）個の前記電圧保持手段と（ｍ×ｎ）個の前記電流変換素子との接続を個々にオンオフする（ｍ×ｎ）個の第一スイッチング手段と、ｎ個の前記制御電極に入力される制御信号に対応してｍ個の前記信号電極と（ｍ×ｎ）個の前記電流変換素子との接続を個々にオンオフする（ｍ×ｎ）個の第二スイッチング手段とを具備していることにより、多数の能動素子を動作制御するために信号電極に制御電圧でなく制御電流が入力されるので、信号電極の電圧降下による多数の能動素子の動作格差を防止することができ、信号電極の制御電流に対応した駆動電流を能動素子に供給することができるので、多数の能動素子を所望の状態に動作制御することができる。

【００８９】請求項５記載の発明は、請求項１ないし４の何れか一記載の素子駆動装置であって、前記電流変換素子が抵抗素子からなることにより、簡単な構造で信号電極の制御電流を制御電圧に変換することができる。

【００９０】請求項６記載の発明は、請求項１ないし４の何れか一記載の素子駆動装置であって、前記電流変換素子が前記駆動トランジスタとカレントミラー回路を形成する変換トランジスタからなることにより、駆動トランジスタと変換トランジスタとがカレントミラー回路を形成するため、信号電極の制御電流に対応した駆動電流を能動素子に供給することができ、より良好な精度で能動素子を所望の状態に動作制御することができる。

【００９１】請求項７記載の発明の素子駆動装置は、能動素子を可変自在な駆動電流で駆動制御する素子駆動装置であって、所定の駆動電圧が印加される電源電極と、この電源電極に印加される駆動電圧をゲート電極に印加される制御電圧に対応した駆動電流に変換して前記能動素子に供給する駆動トランジスタと、前記能動素子を駆動制御するための制御電圧が供給される信号電極と、前記駆動トランジスタとカレントミラー回路を形成する構造で前記信号電極に供給される制御電圧を自身の電気抵抗により制御電流として入力して制御電圧に変換する変換トランジスタと、この変換トランジスタにより変換された制御電圧を保持して前記駆動トランジスタのゲート電極に印加する電圧保持手段と、この電圧保持手段の電圧保持を動作制御するための制御信号が入力される制御電極と、この制御電極に入力される制御信号に対応して前記電圧保持手段と前記変換トランジスタとの接続をオンオフする第一スイッチング手段と、前記制御電極に入力される制御信号に対応して前記信号電極と前記変換トランジスタとの接続をオンオフする第二スイッチング手段とを具備していることにより、駆動トランジスタと変換トランジスタとがカレントミラー回路を形成するため、信号電極の制御電圧に対応した駆動電流を能動素子に供給することができ、能動素子を所望の状態に動作制御することができる。

【００９２】請求項８記載の発明の素子駆動装置は、可変自在な駆動電流で駆動制御される能動素子と、所定の駆動電圧が印加される電源電極と、この電源電極に印加される駆動電圧をゲート電極に印加される制御電圧に対応した駆動電流に変換して前記能動素子に供給する駆動トランジスタと、前記能動素子を駆動制御するための制御電圧が供給される信号電極と、前記駆動トランジスタとカレントミラー回路を形成する構造で前記信号電極に供給される制御電圧を自身の電気抵抗により制御電流として入力して制御電圧に変換する変換トランジスタと、この変換トランジスタにより変換された制御電圧を保持して前記駆動トランジスタのゲート電極に印加する電圧保持手段と、この電圧保持手段の電圧保持を動作制御するための制御信号が入力される制御電極と、この制御電極に入力される制御信号に対応して前記電圧保持手段と前記変換トランジスタとの接続をオンオフする第一スイッチング手段と、前記制御電極に入力される制御信号に対応して前記信号電極と前記変換トランジスタとの接続をオンオフする第二スイッチング手段とを具備していることにより、駆動トランジスタと変換トランジスタとがカレントミラー回路を形成するため、信号電極の制御電圧に対応した駆動電流を能動素子に供給することができ、能動素子を所望の状態に動作制御することができる。

【００９３】請求項９記載の発明の素子駆動装置は、（ｍ×ｎ）個の能動素子を可変自在な駆動電流で個々に駆動制御する素子駆動装置であって、所定の駆動電圧が印加される電源電極と、この一個の電源電極に印加される駆動電圧を各々のゲート電極に個々に印加される制御電圧に対応した駆動電流に個々に変換して（ｍ×ｎ）個の前記能動素子に個々に供給する（ｍ×ｎ）個の駆動トランジスタと、（ｍ×ｎ）個の前記能動素子を個々に駆動制御するためのｎ個の制御電圧が各々に順番に供給されるｍ個の信号電極と、（ｍ×ｎ）個の前記駆動トランジスタの各々とカレントミラー回路を個々に形成する構造でｍ個の前記信号電極の各々に順番に供給されるｎ個の制御電圧を自身の電気抵抗によりｎ個の制御電流として入力して（ｍ×ｎ）個の制御電圧に変換する（ｍ×ｎ）個の変換トランジスタと、これら（ｍ×ｎ）個の変換トランジスタにより変換された（ｍ×ｎ）個の制御電圧を個々に保持して（ｍ×ｎ）個の前記駆動トランジスタのゲート電極に個々に印加する（ｍ×ｎ）個の電圧保持手段と、これら（ｍ×ｎ）個の電圧保持手段の電圧保持を個々に動作制御するための制御信号が順番に入力されるｎ個の制御電極と、これらｎ個の制御電極に順番に入力されるｍ個の制御信号に対応して（ｍ×ｎ）個の前記電圧保持手段と（ｍ×ｎ）個の前記変換トランジスタとの接続を個々にオンオフする（ｍ×ｎ）個の第一スイッチング手段と、ｎ個の前記制御電極に入力される制御信号に対応してｍ個の前記信号

電極と(m×n)個の前記変換トランジスタとの接続を個々にオンオフする(m×n)個の第二スイッチング手段とを具備していることにより、駆動トランジスタと変換トランジスタとがカレントミラー回路を形成するため、信号電極の制御電圧に対応した駆動電流を能動素子に供給することができ、多数の能動素子を所望の状態に動作制御することができる。

【００９４】請求項１０記載の発明の素子駆動装置は、可変自在な駆動電流で駆動制御される(m×n)個の能動素子と、所定の駆動電圧が印加される電源電極と、この一個の電源電極に印加される駆動電圧を各々のゲート電極に個々に印加される制御電圧に対応した駆動電流に個々に変換して(m×n)個の前記能動素子に個々に供給する(m×n)個の駆動トランジスタと、(m×n)個の前記能動素子を個々に駆動制御するためのn個の制御電圧が各々に順番に供給されるm個の信号電極と、(m×n)個の前記駆動トランジスタの各々とカレントミラー回路を個々に形成する構造でm個の前記信号電極の各々に順番に供給されるn個の制御電圧を自身の電気抵抗によりn個の制御電流として入力して(m×n)個の制御電圧に変換する(m×n)個の変換トランジスタと、これら(m×n)個の変換トランジスタにより変換された(m×n)個の制御電圧を個々に保持して(m×n)個の前記駆動トランジスタのゲート電極に個々に印加する(m×n)個の電圧保持手段と、これら(m×n)個の電圧保持手段の電圧保持を個々に動作制御するための制御信号が順番に入力されるn個の制御電極と、これらn個の制御電極に順番に入力されるm個の制御信号に対応して(m×n)個の前記電圧保持手段と(m×n)個の前記変換トランジスタとの接続を個々にオンオフする(m×n)個の第一スイッチング手段と、n個の前記制御電極に入力される制御信号に対応してm個の前記信号電極と(m×n)個の前記変換トランジスタとの接続を個々にオンオフする(m×n)個の第二スイッチング手段とを具備していることにより、駆動トランジスタと変換トランジスタとがカレントミラー回路を形成するため、信号電極の制御電圧に対応した駆動電流を能動素子に供給することができ、多数の能動素子を所望の状態に動作制御することができる。

【００９５】請求項１１記載の発明は、請求項１ないし１０の何れか一記載の素子駆動装置であって、前記能動素子が有機ＥＬ素子からなることにより、能動素子である有機ＥＬ素子を信号電極の制御電流に対応した輝度で発光させることができる。

【００９６】請求項１２記載の発明は、請求項６ないし１１の何れか一記載の素子駆動装置であって、前記駆動トランジスタと前記変換トランジスタとの各々がＴＦＴからなり、前記駆動トランジスタと前記変換トランジスタとのＴＦＴが一個の回路基板の近接した位置に並設されていることにより、駆動トランジスタと変換トランジスタとの製造誤差による動作特性の変動を同等することができるので、駆動トランジスタが駆動電圧から変換する駆動電流を変換トランジスタに供給される制御電流に正確に対応させることができ、能動素子を所望の状態に正確に動作制御することができる。

【００９７】請求項１３記載の発明は、請求項１ないし１２の何れか一記載の素子駆動装置であって、前記駆動トランジスタに第一抵抗素子が直列に接続されており、前記変換トランジスタに第二抵抗素子が直列に接続されていることにより、駆動トランジスタの電圧変動に対する電流変化の割合を低減することができ、第一第二抵抗素子により駆動トランジスタと変換トランジスタとのカレントミラー回路としての動作を良好に維持することができるので、能動素子を所望の状態に正確に動作制御することができる。

【００９８】請求項１４記載の発明は、請求項１３記載の素子駆動装置であって、前記第一第二抵抗素子の各々がドレイン電極とゲート電極とが短絡されたＴＦＴからなることにより、例えば、駆動トランジスタと変換トランジスタともＴＦＴからなる場合、これらと第一第二抵抗素子のＴＦＴとを同一工程で製造することができるので、素子駆動装置の生産性を向上させることができる。

【００９９】請求項１５記載の発明は、請求項１４記載の素子駆動装置であって、前記第一抵抗素子と前記第二抵抗素子とのＴＦＴが一個の回路基板の近接した位置に並設されていることにより、第一第二抵抗素子の製造誤差による特性変動を同等とすることができるので、駆動トランジスタと変換トランジスタとをカレントミラー回路として良好に動作させることができる。

【０１００】請求項１６記載の発明は、請求項１ないし１５の何れか一記載の素子駆動装置であって、前記第一スイッチング手段と前記第二スイッチング手段とがＴＦＴからなることにより、駆動トランジスタと変換トランジスタとや第一第二抵抗素子がＴＦＴからなる場合、これらと第一第二スイッチング手段のＴＦＴとを同一工程で製造することができるので、素子駆動装置の生産性を向上させることができる。

【０１０１】請求項１７記載の発明の素子駆動方法は、可変自在な駆動電流で駆動制御される能動素子と、所定の駆動電圧が印加される電源電極と、該電源電極に印加される駆動電圧をゲート電極に印加される制御電圧に対応した駆動電流に変換して前記能動素子に供給する駆動トランジスタと、前記能動素子を駆動制御するための制御電力が供給される信号電極と、該信号電極に供給される制御電力に対応した制御電圧を保持して前記駆動トランジスタのゲート電極に印加する電圧保持手段と、該電圧保持手段の電圧保持を動作制御するための制御信号が入力される制御電極と、を具備している素子駆動装置の素子駆動方法において、前記信号電極に制御電力として制御電流を供給し、該信号電極に供給される制御電流を電流変換素子により制御電圧に変換して前記電圧保持手

段に保持させ、前記制御電極に入力される制御信号に対応して前記電圧保持手段と前記電流変換素子との接続をオンオフするとともに前記信号電極と前記電流変換素子との接続もオンオフするようにしたことにより、能動素子を動作制御するために信号電極に制御電圧でなく制御電流が入力されるので、一個の信号電極に多数の能動素子が接続されるような構造でも電圧降下による能動素子の動作格差を防止することができ、信号電極の制御電流に対応した駆動電流を能動素子に供給することができるので、能動素子を所望の状態に動作制御することができる。

【０１０２】請求項１８記載の発明の素子駆動方法は、可変自在な駆動電流で駆動制御される能動素子と、所定の駆動電圧が印加される電源電極と、該電源電極に印加される駆動電圧をゲート電極に印加される制御電圧に対応した駆動電流に変換して前記能動素子に供給する駆動トランジスタと、前記能動素子を駆動制御するための制御電圧が供給される信号電極と、該信号電極に供給される制御電圧を保持して前記駆動トランジスタのゲート電極に印加する電圧保持手段と、該電圧保持手段の電圧保持を動作制御するための制御信号が入力される制御電極と、を具備している素子駆動装置の素子駆動方法であって、前記信号電極に供給される制御電圧を前記駆動トランジスタとカレントミラー回路を形成する構造の変換トランジスタに電気抵抗で制御電流として入力させて制御電圧に変換させてから前記電圧保持手段に保持させ、前記制御電極に入力される制御信号に対応して前記電圧保持手段と前記変換トランジスタとの接続をオンオフするとともに前記信号電極と前記変換トランジスタとの接続をオンオフするようにしたことにより、駆動トランジスタと変換トランジスタとがカレントミラー回路を形成するため、信号電極の制御電圧に対応した駆動電流を能動素子に供給することができ、能動素子を所望の状態に動作制御することができる。

【０１０３】請求項１９記載の発明の素子駆動方法は、可変自在な駆動電流で駆動制御される能動素子と、所定の駆動電圧が印加される電源電極と、該電源電極に印加される駆動電圧をゲート電極に印加される制御電圧に対応した駆動電流に変換して前記能動素子に供給する駆動トランジスタと、前記能動素子を駆動制御するための制御電力が供給される信号電極と、該信号電極に供給される制御電力に対応した制御電圧を保持して前記駆動トランジスタのゲート電極に印加する電圧保持手段と、該電圧保持手段の電圧保持を動作制御するための制御信号が入力される制御電極と、を具備している素子駆動装置の素子駆動方法において、前記信号電極に制御電力として制御電流を供給し、前記信号電極に供給される制御電流を前記駆動トランジスタとカレントミラー回路を形成する構造の変換トランジスタにより制御電圧に変換して前記電圧保持手段に保持させ、前記制御電極に入力される制御信号に対応して前記電圧保持手段と前記変換トランジスタとの接続をオンオフするとともに前記信号電極と前記変換トランジスタとの接続もオンオフするようにしたことにより、能動素子を動作制御するために信号電極に制御電圧でなく制御電流が入力されるので、一個の信号電極に多数の能動素子が接続されるような構造でも電圧降下による能動素子の動作格差を防止することができ、駆動トランジスタと変換トランジスタとがカレントミラー回路を形成するため、信号電極の制御電流に対応した駆動電流を能動素子に供給することができ、能動素子を所望の状態に動作制御することができる。

【０１０４】請求項２０記載の発明の素子駆動方法は、能動素子を可変自在な駆動電流で駆動制御する素子駆動方法であって、第一第二トランジスタをカレントミラー回路として動作させ、前記第一トランジスタが前記能動素子を駆動する電流源として動作するように、前記第二トランジスタを駆動する信号を電流値が切換自在な定電流源から供給される電流信号とするようにしたことにより、能動素子を動作制御するために信号電極に制御電圧でなく制御電流が入力されるので、一個の信号電極に多数の能動素子が接続されるような構造でも電圧降下による能動素子の動作格差を防止することができ、駆動トランジスタと変換トランジスタとがカレントミラー回路を形成するため、信号電極の制御電流に対応した駆動電流を能動素子に供給することができ、能動素子を所望の状態に動作制御することができる。

【０１０５】請求項２１記載の発明の素子駆動方法は、能動素子を可変自在な駆動電流で駆動制御する素子駆動方法であって、前記能動素子の駆動電流を駆動トランジスタで直接制御し、前記駆動トランジスタの駆動電圧を制御する信号を電流値が切換自在な定電流源から供給される電流信号とするようにしたことにより、能動素子を動作制御するために信号電極に制御電圧でなく制御電流が入力されるので、一個の信号電極に多数の能動素子が接続されるような構造でも電圧降下による能動素子の動作格差を防止することができ、信号電極の制御電流に対応した駆動電流を能動素子に供給することができるので、能動素子を所望の状態に動作制御することができる。

【０１０６】請求項２２記載の発明の画像表示装置は、請求項３記載の発明の素子駆動装置と、m行ｎ列に配列された表示素子からなる(m×ｎ)個の前記能動素子と、を具備していることにより、画素単位で階調されたm行ｎ列のドットマトリクスの画像を良好な品質で表示することができる。

【０１０７】請求項２３記載の発明の画像表示装置は、請求項４記載の発明の素子駆動装置の(m×ｎ)個の前記能動素子がm行ｎ列に配列された表示素子からなることにより、画素単位で階調されたm行ｎ列のドットマトリクスの画像を良好な品質で表示することができる。

【図面の簡単な説明】

【図１】本発明の実施の第一の形態の素子駆動装置を示す回路図である。

【図２】実施の第一の形態の素子駆動装置の要部の薄膜構造を示す平面図である。

【図３】本発明の実施の第一の形態の画像表示装置を示すブロック図である。

【図４】画像表示装置の電流ドライバの部分を示す回路図である。

【図５】第一の変形例の素子駆動装置を示す回路図である。

【図６】第二の変形例の素子駆動装置を示す回路図である。

【図７】本発明の実施の第二の形態の素子駆動装置を示す回路図である。

【図８】第三の変形例の素子駆動装置を示す回路図である。

【図９】第四の変形例の素子駆動装置を示す回路図である。

【図１０】第五の変形例の素子駆動装置を示す回路図である。

【図１１】第六の変形例の素子駆動装置を示す回路図である。

【図１２】第七の変形例の素子駆動装置を示す回路図である。

【図１３】第八の変形例の素子駆動装置を示す回路図である。

【図１４】第九の変形例の素子駆動装置を示す回路図である。

【図１５】一従来例の素子駆動装置を示す回路図である。

【符号の説明】

１１，３１，３５，４１，５１，６１，７１，８１，９１，１０１，１１１素子駆動装置

１２　能動素子である有機ＥＬ素子

１３　電源電極である電源線

１４　電源電極である接地線

１５，３２　駆動トランジスタである駆動ＴＦＴ

１６　電圧保持手段である保持コンデンサ

１７　第一スイッチング手段である第一スイッチング素子

１８，３３　電流変換素子であり変換トランジスタである変換ＴＦＴ

１９　回路基板

２０　第二スイッチング手段である第二スイッチング素子

２１　信号電極である信号線

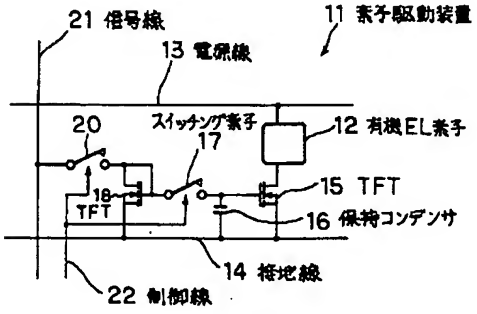
２２　制御電極である制御線

３６　電流変換素子である抵抗素子

４２，６２，７２　第一抵抗素子

４３，６３，７３　第二抵抗素子

【図１】



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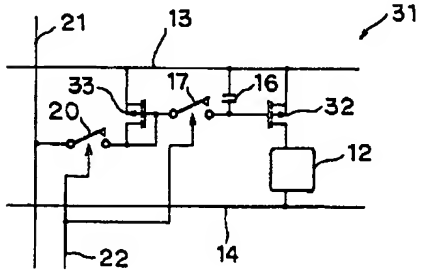

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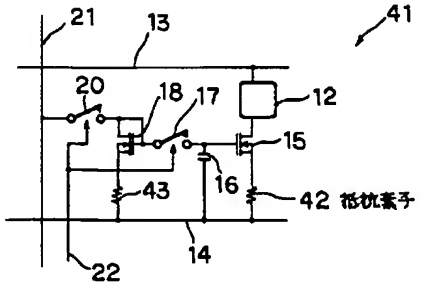

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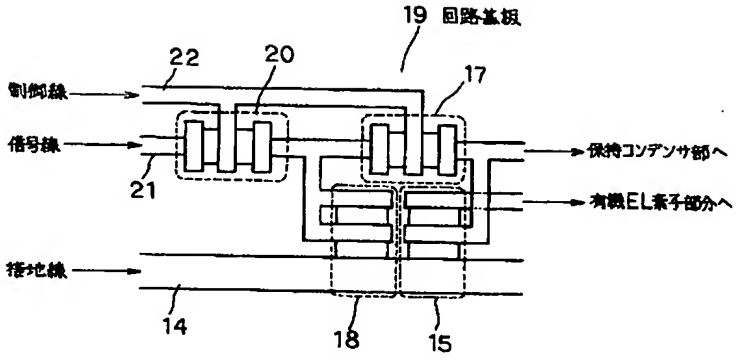
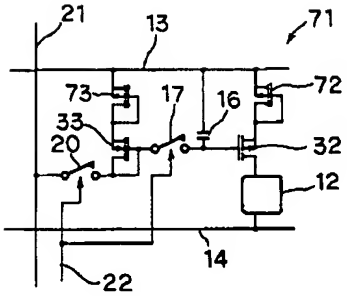

19 回路基板
22
20
17
制御線
信号線
21
保持コンデンサ部へ
有機EL素子部分へ
接地線
14
18
15

【図１０】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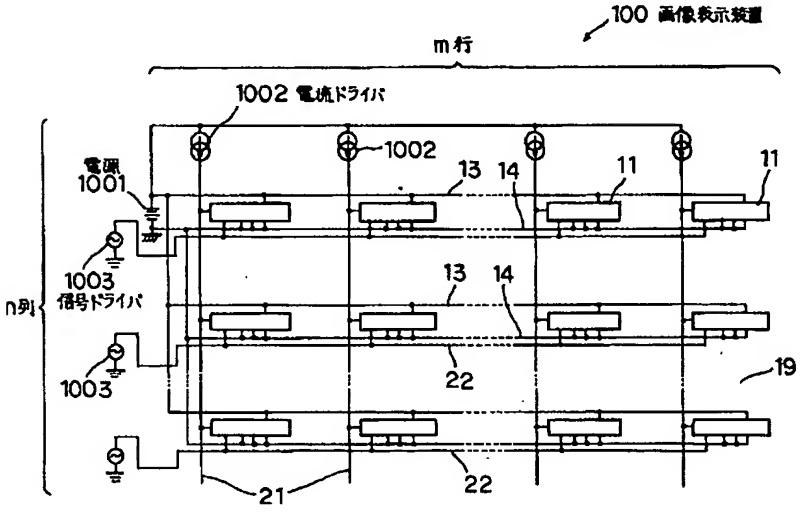
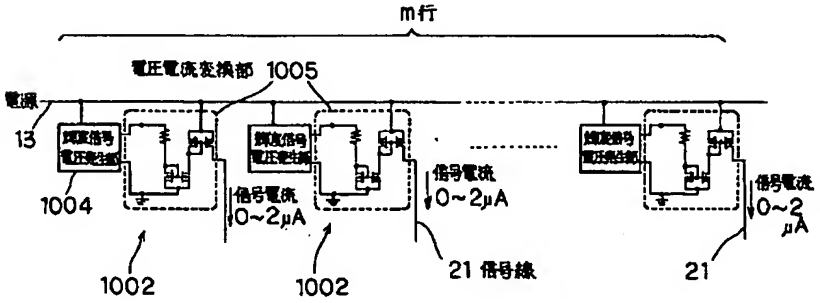
22

【図３】


100 画像表示装置
m行
1002 電流ドライバ
1002
電源
1001
13
14
11
11
1003
信号ドライバ
n列
13
14
1003
22
19
21
22

【図４】


m行
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13
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1004
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0~2μA
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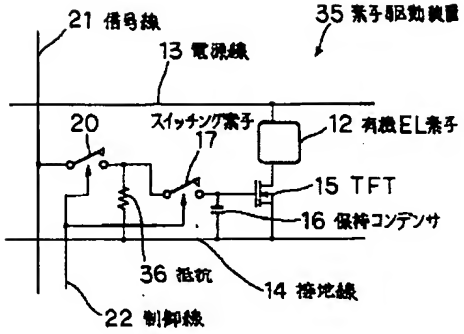
信号電流
0~2
μA
1002
1002
21 信号線
21

【図６】



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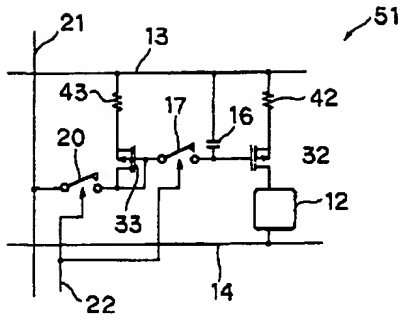

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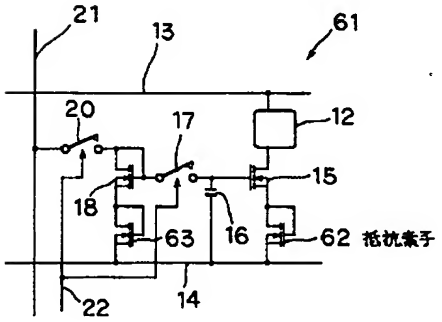

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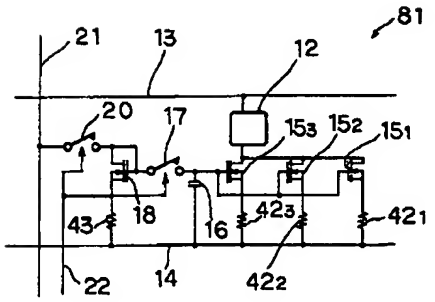

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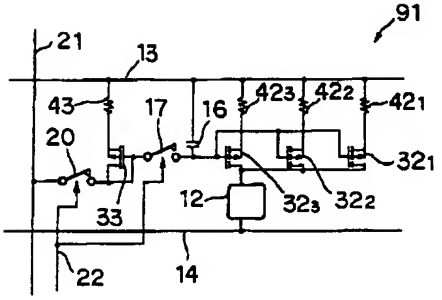

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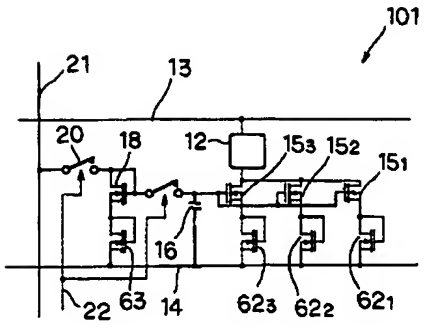

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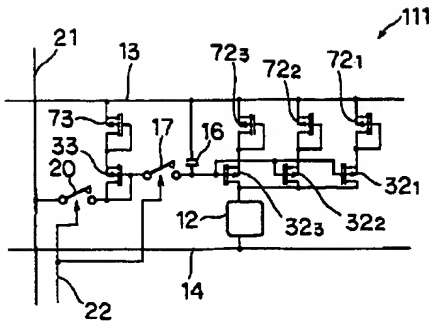
111
21
13
72_3
72_2
72_1
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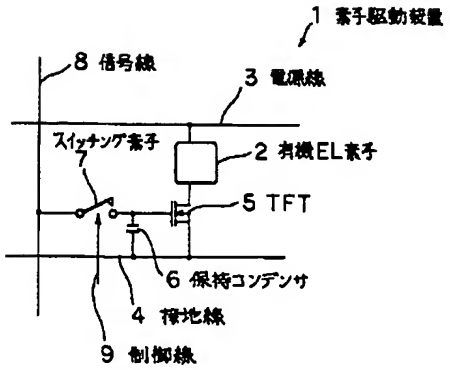
32_1
12
32_3
32_2
14
22

【図１５】


1 素子駆動装置
8 信号線
3 電源線
スイッチング素子
7
2 有機EL素子
5 TFT
6 保持コンデンサ
4 接地線
9 制御線

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The power-source electrode with which it is the component driving gear which carries out drive control of the active element with the drive current in which adjustable is free, and predetermined driver voltage is impressed, The drive transistor which changes into the drive current corresponding to the control voltage to which the driver voltage impressed to this power-source electrode is impressed by the gate electrode, and is supplied to said active element, The signal electrode with which the control current for carrying out drive control of said active element is supplied, The current sensing element which changes into control voltage the control current supplied to this signal electrode, An electrical-potential-difference maintenance means by which holds the control voltage changed by this current sensing element, and it is impressed by the gate electrode of said drive transistor, The control electrode into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of this electrical-potential-difference maintenance means is inputted, A first switching means to turn on and off connection with said electrical-potential-difference maintenance means and said current sensing element corresponding to the control signal inputted into this control electrode, The component driving gear possessing a second switching means to turn on and off connection with said signal electrode and said current sensing element corresponding to the control signal inputted into said control electrode.
[Claim 2] The active element by which drive control is carried out with the drive current in which adjustable is free, and the power-source electrode with which predetermined driver voltage is impressed, The drive transistor which changes into the drive current corresponding to the control voltage to which the driver voltage impressed to this power-source electrode is impressed by the gate electrode, and is supplied to said active element, The signal electrode with which the control current for carrying out drive control of said active element is supplied, The current sensing element which changes into control voltage the control current supplied to this signal electrode, An electrical-potential-difference maintenance means by which holds the control voltage changed by this current sensing element, and it is impressed by the gate electrode of said drive transistor, The control electrode into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of this electrical-potential-difference maintenance means is inputted, A first switching means to turn on and off connection with said electrical-potential-difference maintenance means and said current sensing element corresponding to the control signal inputted into this control electrode, The component driving gear possessing a second switching means to turn on and off connection with said signal electrode and said current sensing element corresponding to the control signal inputted into said control electrode.
[Claim 3] The power-source electrode with which it is the component driving gear which carries out drive control of the active element of an individual separately with the drive current in which adjustable is free, and predetermined driver voltage is impressed, (mxn:m and n are the natural number) The drive transistor of the individual (mxn) which changes into each gate electrode separately the driver voltage impressed to the power-source electrode of this piece at the drive current corresponding to the control voltage by which it is impressed separately, and is separately supplied to said active element of an

individual (mxn), m signal electrodes with which the n control currents for carrying out drive control of said active element of an individual separately are supplied to each in order, (mxn) The current sensing element of the individual (mxn) which changes into the control voltage of an individual (mxn) the n control currents supplied to each of these m signal electrodes in order, The electrical-potential-difference maintenance means of the individual (mxn) which holds separately the control voltage of the individual (mxn) changed by the current sensing element of these (mxn) individuals, and is separately impressed to the gate electrode of said drive transistor of an individual (mxn), n control electrodes into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of the electrical-potential-difference maintenance means of these (mxn) individuals separately is inputted in order, A first switching means of an individual (mxn) to turn on and off connection between said electrical-potential-difference maintenance means of an individual (mxn), and said current sensing element of an individual (mxn) separately corresponding to m control signals inputted into these n control electrodes in order, The component driving gear possessing a second switching means of an individual (mxn) to turn on and off connection between said m signal electrodes and said current sensing element of an individual (mxn) separately corresponding to the control signal inputted into said n control electrodes.

[Claim 4] The active element of the individual by which drive control is carried out with the drive current in which adjustable is free (mxn), and the power-source electrode with which predetermined driver voltage is impressed, The drive transistor of the individual (mxn) which changes into each gate electrode separately the driver voltage impressed to the power-source electrode of this piece at the drive current corresponding to the control voltage by which it is impressed separately, and is separately supplied to said active element of an individual (mxn), m signal electrodes with which the n control currents for carrying out drive control of said active element of an individual separately are supplied to each in order, (mxn) The current sensing element of the individual (mxn) which changes into the control voltage of an individual (mxn) the n control currents supplied to each of these m signal electrodes in order, The electrical-potential-difference maintenance means of the individual (mxn) which holds separately the control voltage of the individual (mxn) changed by the current sensing element of these (mxn) individuals, and is separately impressed to the gate electrode of said drive transistor of an individual (mxn), n control electrodes into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of the electrical-potential-difference maintenance means of these (mxn) individuals separately is inputted in order, A first switching means of an individual (mxn) to turn on and off connection between said electrical-potential-difference maintenance means of an individual (mxn), and said current sensing element of an individual (mxn) separately corresponding to m control signals inputted into these n control electrodes in order, The component driving gear possessing a second switching means of an individual (mxn) to turn on and off connection between said m signal electrodes and said current sensing element of an individual (mxn) separately corresponding to the control signal inputted into said n control electrodes.

[Claim 5] Claim 1 which said current sensing element becomes from a resistance element thru/or the component driving gear of any 1 publication of 4.

[Claim 6] Claim 1 which said current sensing element becomes from said drive transistor and the conversion transistor which forms current Miller circuit thru/or the component driving gear of any 1 publication of 4.

[Claim 7] The power-source electrode with which it is the component driving gear which carries out drive control of the active element with the drive current in which adjustable is free, and predetermined driver voltage is impressed, The drive transistor which changes into the drive current corresponding to the control voltage to which the driver voltage impressed to this power-source electrode is impressed by the gate electrode, and is supplied to said active element, The signal electrode with which the control voltage for carrying out drive control of said active element is supplied, The conversion transistor which inputs the control voltage supplied to said signal electrode with the structure which forms said drive transistor and current Miller circuit as the control current with own electric resistance, and changes it into control voltage, An electrical-potential-difference maintenance means by which holds the control

voltage changed with this conversion transistor, and it is impressed by the gate electrode of said drive transistor, The control electrode into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of this electrical-potential-difference maintenance means is inputted, A first switching means to turn on and off connection with said electrical-potential-difference maintenance means and said conversion transistor corresponding to the control signal inputted into this control electrode, The component driving gear possessing a second switching means to turn on and off connection with said signal electrode and said conversion transistor corresponding to the control signal inputted into said control electrode.

[Claim 8] The active element by which drive control is carried out with the drive current in which adjustable is free, and the power-source electrode with which predetermined driver voltage is impressed, The drive transistor which changes into the drive current corresponding to the control voltage to which the driver voltage impressed to this power-source electrode is impressed by the gate electrode, and is supplied to said active element, The signal electrode with which the control voltage for carrying out drive control of said active element is supplied, The conversion transistor which inputs the control voltage supplied to said signal electrode with the structure which forms said drive transistor and current Miller circuit as the control current with own electric resistance, and changes it into control voltage, An electrical-potential-difference maintenance means by which holds the control voltage changed with this conversion transistor, and it is impressed by the gate electrode of said drive transistor, The control electrode into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of this electrical-potential-difference maintenance means is inputted, A first switching means to turn on and off connection with said electrical-potential-difference maintenance means and said conversion transistor corresponding to the control signal inputted into this control electrode, The component driving gear possessing a second switching means to turn on and off connection with said signal electrode and said conversion transistor corresponding to the control signal inputted into said control electrode.

[Claim 9] The power-source electrode with which it is the component driving gear which carries out drive control of the active element of an individual separately with the drive current in which adjustable is free, and predetermined driver voltage is impressed, (mxn) The drive transistor of the individual (mxn) which changes into each gate electrode separately the driver voltage impressed to the power-source electrode of this piece at the drive current corresponding to the control voltage by which it is impressed separately, and is separately supplied to said active element of an individual (mxn), m signal electrodes with which the control voltage of n pieces for carrying out drive control of said active element of an individual separately is supplied to each in order, (mxn) The control voltage of n pieces supplied to each of said m signal electrodes in order with the structure which forms each and current Miller circuit of said drive transistor of an individual separately (mxn) With own electric resistance The conversion transistor of the individual (mxn) which inputs as the n control currents and is changed into the control voltage of an individual (mxn), The electrical-potential-difference maintenance means of the individual (mxn) which holds separately the control voltage of the individual (mxn) changed with the conversion transistor of these (mxn) individuals, and is separately impressed to the gate electrode of said drive transistor of an individual (mxn), n control electrodes into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of the electrical-potential-difference maintenance means of these (mxn) individuals separately is inputted in order, A first switching means of an individual (mxn) to turn on and off connection between said electrical-potential-difference maintenance means of an individual (mxn), and said conversion transistor of an individual (mxn) separately corresponding to m control signals inputted into these n control electrodes in order, The component driving gear possessing a second switching means of an individual (mxn) to turn on and off connection between said m signal electrodes and said conversion transistor of an individual (mxn) separately corresponding to the control signal inputted into said n control electrodes.

[Claim 10] The active element of the individual by which drive control is carried out with the drive current in which adjustable is free (mxn), and the power-source electrode with which predetermined driver voltage is impressed, The drive transistor of the individual (mxn) which changes into each gate

electrode separately the driver voltage impressed to the power-source electrode of this piece at the drive current corresponding to the control voltage by which it is impressed separately, and is separately supplied to said active element of an individual (mxn), m signal electrodes with which the control voltage of n pieces for carrying out drive control of said active element of an individual separately is supplied to each in order, (mxn) The control voltage of n pieces supplied to each of said m signal electrodes in order with the structure which forms each and current Miller circuit of said drive transistor of an individual separately (mxn) With own electric resistance The conversion transistor of the individual (mxn) which inputs as the n control currents and is changed into the control voltage of an individual (mxn), The electrical-potential-difference maintenance means of the individual (mxn) which holds separately the control voltage of the individual (mxn) changed with the conversion transistor of these (mxn) individuals, and is separately impressed to the gate electrode of said drive transistor of an individual (mxn), n control electrodes into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of the electrical-potential-difference maintenance means of these (mxn) individuals separately is inputted in order, A first switching means of an individual (mxn) to turn on and off connection between said electrical-potential-difference maintenance means of an individual (mxn), and said conversion transistor of an individual (mxn) separately corresponding to m control signals inputted into these n control electrodes in order, The component driving gear possessing a second switching means of an individual (mxn) to turn on and off connection between said m signal electrodes and said conversion transistor of an individual (mxn) separately corresponding to the control signal inputted into said n control electrodes.

[Claim 11] Claim 1 which said active element becomes from an organic electroluminescence (Electro-Luminescence) component thru/or the component driving gear of any 1 publication of 10.

[Claim 12] Claim 6 by which TFT of said drive transistor and said conversion transistor is installed in the location where the circuit board of a piece approached side by side by each of said drive transistor and said conversion transistor consisting of TFT (Thin Film Transistor) thru/or the component driving gear of any 1 publication of 11.

[Claim 13] Claim 1 by which the first resistance element is connected to said drive transistor at the serial, and the second resistance element is connected to said conversion transistor at the serial thru/or the component driving gear of any 1 publication of 12.

[Claim 14] The component driving gear according to claim 13 with which each of the second resistance element consists of TFT which the drain electrode and the gate electrode short-circuited for a start [said].

[Claim 15] The component driving gear according to claim 14 with which TFT of said first resistance element and said second resistance element is installed in the location where the circuit board of a piece approached side by side.

[Claim 16] Claim 1 which said first switching means and said second switching means become from TFT thru/or the component driving gear of any 1 publication of 15.

[Claim 17] The active element by which drive control is carried out with the drive current in which adjustable is free, and the power-source electrode with which predetermined driver voltage is impressed, The drive transistor which changes into the drive current corresponding to the control voltage to which the driver voltage impressed to this power-source electrode is impressed by the gate electrode, and is supplied to said active element, The signal electrode with which the control power for carrying out drive control of said active element is supplied, An electrical-potential-difference maintenance means by which holds the control voltage corresponding to the control power supplied to this signal electrode, and it is impressed by the gate electrode of said drive transistor, In the component drive approach of a component driving gear of providing the control electrode into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of this electrical-potential-difference maintenance means is inputted Change into control voltage the control current which supplies the control current to said signal electrode as control power, and is supplied to this signal electrode by the current sensing element, and it is made to hold for said electrical-potential-difference maintenance means. The component drive approach of having also turned on and off connection with said signal

electrode and said current sensing element while turning on and off connection with said electrical-potential-difference maintenance means and said current sensing element corresponding to the control signal inputted into said control electrode.

[Claim 18] The active element by which drive control is carried out with the drive current in which adjustable is free, and the power-source electrode with which predetermined driver voltage is impressed, The drive transistor which changes into the drive current corresponding to the control voltage to which the driver voltage impressed to this power-source electrode is impressed by the gate electrode, and is supplied to said active element, The signal electrode with which the control voltage for carrying out drive control of said active element is supplied, An electrical-potential-difference maintenance means by which holds the control voltage supplied to this signal electrode, and it is impressed by the gate electrode of said drive transistor, The control electrode into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of this electrical-potential-difference maintenance means is inputted, It is the component drive approach of the provided component driving gear. Since the control voltage supplied to said signal electrode is made to input into said drive transistor and the conversion transistor of the structure which forms current Miller circuit as the control current with electric resistance and is transformed to control voltage, it is made to hold for said electrical-potential-difference maintenance means. The component drive approach of having turned on and off connection with said signal electrode and said conversion transistor while turning on and off connection with said electrical-potential-difference maintenance means and said conversion transistor corresponding to the control signal inputted into said control electrode.

[Claim 19] The active element by which drive control is carried out with the drive current in which adjustable is free, and the power-source electrode with which predetermined driver voltage is impressed, The drive transistor which changes into the drive current corresponding to the control voltage to which the driver voltage impressed to this power-source electrode is impressed by the gate electrode, and is supplied to said active element, The signal electrode with which the control power for carrying out drive control of said active element is supplied, An electrical-potential-difference maintenance means by which holds the control voltage corresponding to the control power supplied to this signal electrode, and it is impressed by the gate electrode of said drive transistor, In the component drive approach of a component driving gear of providing the control electrode into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of this electrical-potential-difference maintenance means is inputted Change into control voltage the control current which supplies the control current to said signal electrode as control power, and is supplied to said signal electrode with said drive transistor and the conversion transistor of the structure which forms current Miller circuit, and it is made to hold for said electrical-potential-difference maintenance means. The component drive approach of having also turned on and off connection with said signal electrode and said conversion transistor while turning on and off connection with said electrical-potential-difference maintenance means and said conversion transistor corresponding to the control signal inputted into said control electrode.

[Claim 20] The component drive approach which was made to make it into the current signal to which the signal which drives said second transistor is supplied from the constant current source which a current value can switch freely so that it may be the component drive approach which carries out drive control of the active element with the drive current in which adjustable is free, the second transistor may be operated as current Miller circuit for a start and it may operate as a current source to which said first transistor drives said active element.

[Claim 21] The component drive approach which was made to make it into the current signal to which the signal which is the component drive approach which carries out drive control of the active element with the drive current in which adjustable is free, controls directly the drive current of said active element with a drive transistor, and controls the driver voltage of said drive transistor is supplied from the constant current source which a current value can switch freely.

[Claim 22] The image display device possessing said active element of the component driving gear of invention according to claim 3, and the individual which consists of a display device arranged by the m

line n train (mxn).
[Claim 23] The image display device with which said active element of the individual (mxn) of the component driving gear of invention according to claim 4 consists of a display device arranged by the m line n train.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the component driving gear which carries out drive control of the active element according to the drive current in which adjustable is free, and the image display device which carries out drive control of many active elements with this component driving gear.
[0002]
[Description of the Prior Art] Current and the active element by which motion control is carried out actively are used for various equipments, for example, display devices, such as a light emitting device, are used as an active element in the image display device. There is an EL element etc. as this light emitting device, and there are a non-element child and an organic component as this EL element.
[0003] The inorganic EL element is put in practical use as a back light of a liquid crystal display etc., for example noting that uniform field luminescence is realizable by power saving. on the other hand, an organic EL device is made [that it can drive by the direct current of a low battery, and realizes high brightness efficient although development to a day has research technical problems, such as endurance, shallowly, or], and responsibility is also good -- etc. -- since a property is provided, utilization is demanded. Since drive control of the organic EL device is carried out with a current as mentioned above, the structure of a component driving gear will also be different from the conventional inorganic EL element by which drive control is carried out on an electrical potential difference.
[0004] For example, the component driving gear which drives the light emitting device of current control molds, such as an organic EL device, by the active matrix is indicated by JP,8-54835,A. However, it becomes [the number of a transistor] huge and is not practical in order to control the gradation of an organic EL device by turning on and off of two or more transistors with this component driving gear, and to express multi-tone.
[0005] Moreover, the component driving gear which carries out the electrical-potential-difference drive of the inorganic EL element is indicated by JP,5-74569,A. In the component driving gear of the above-mentioned official report, the power-source electrode with which predetermined driver voltage is impressed is connected to the inorganic EL element through TFT, it changes into the drive current corresponding to the control voltage to which the driver voltage impressed to a power-source electrode by this TFT is impressed by the gate electrode, and an inorganic EL element is supplied.
[0006] Since the luminescence brightness of an inorganic EL element is controlled by controlling the electrical potential difference which the electrical-potential-difference maintenance means is connected to the gate electrode of TFT, and is made to hold for this electrical-potential-difference maintenance means in order to control the amount of supply of this current, in order to make the number of gradation of a component unit increase, it is not necessary to increase the number of a transistor like the equipment of JP,8-54835,A mentioned above.
[0007] Then, it is explained below with reference to drawing 15 , using as the 1 conventional example the component driving gear which applied the component driving gear of such structure to the organic

EL device which is an active element of a current control mold. In addition, this drawing is a circuit diagram showing the component driving gear of the 1 conventional example.
[0008] The component driving gear 1 illustrated as a 1 conventional example here possesses the organic EL device 2 as an active element, and possesses the power-source line 3 and the grounding conductor 4 as a power-source electrode of a pair. Predetermined driver voltage is impressed to the power-source line 3, and the grounding conductor 4 is grounded.
[0009] The organic EL device 2 is connected to the grounding conductor 4 through TFT5, although it connects with the power-source line 3 directly. This TFT5 is changed into the drive current corresponding to the control voltage to which the driver voltage impressed to a grounding conductor 4 is impressed by the gate electrode from the power-source line 3, and is supplied to an organic EL device 2.

[0010] The maintenance capacitor 6 is connected to the gate electrode of TFT5 as an electrical-potential-difference maintenance means, and this maintenance capacitor 6 is also connected to the grounding conductor 4. Moreover, the signal line 8 which is a signal electrode is connected to this maintenance capacitor 6 and the gate electrode of TFT5 through the switching element 7 which is a switching means, and the control line 9 which is a control electrode is connected to the control terminal of this switching element 7.
[0011] The maintenance capacitor 6 holds control voltage, and impresses it to the gate electrode of TFT5, and a switching element 7 turns on and off connection between the maintenance capacitor 6 and a signal line 8. The control voltage for carrying out drive control of the luminescence brightness of an organic EL device 2 is supplied to a signal line 8, and the control signal for carrying out motion control of the switching element 7 to the control line 9 is inputted into it.
[0012] The above component driving gears 1 of structure can carry out drive control of the organic EL device 2 by the luminescence brightness in which adjustable is free. In that case, a control signal is inputted into the control line 9, motion control of the switching element 7 is carried out to an ON state, and the control voltage corresponding to the luminescence brightness of an organic EL device 2 is made to supply and hold from a signal line 8 to the maintenance capacitor 6 in this condition.
[0013] Since the control voltage which this maintenance capacitor 6 held is impressed to the gate electrode of TFT5, the driver voltage always impressed to the power-source line 3 will be changed into the drive current corresponding to gate voltage by TFT5, an organic EL device 2 will be supplied, and this condition is continued even if motion control of the switching element 7 is carried out to an OFF state by the control signal of the control line 9.
[0014] Since the drive current which is changed from the driver voltage of the power-source line 3 by TFT5, and is supplied to an organic EL device 2 corresponds to the electrical potential difference impressed to the gate electrode of TFT5 from the maintenance capacitor 6, an organic EL device 2 will emit light by the brightness corresponding to the control voltage supplied to the signal line 8.
[0015] Using the above component driving gears 1 as an image display device in fact is assumed. In that case, the organic EL device 2 of an individual (mxn) is arranged in a m line n train, the matrix input of control voltage and the control signal is carried out at m signal lines 8 and the n control lines 9, and control voltage is made to hold separately to the maintenance capacitor 6 of an individual (mxn).
[0016] Since the driver voltage of the power-source line 3 of a piece is separately impressed now to the organic EL device 2 of an individual by TFT5 of an individual (mxn) as a drive current (mxn) corresponding to the maintenance electrical potential difference of the maintenance capacitor 6 of an individual (mxn), the image of the dot matrix by which these organic EL devices 2 were made to emit light by the brightness which is separately different, and the gradation expression was carried out per pixel can be displayed.
[0017]
[Problem(s) to be Solved by the Invention] In the above component driving gears 1, the drive current supplied to an organic EL device 2 free [adjustable] is generable from the driver voltage supplied by the power-source line 3 by TFT5. This TFT5 can control the drive current generated from driver voltage by the maintenance electrical potential difference of the maintenance capacitor 6, and can control the

maintenance electrical potential difference of this maintenance capacitor 6 by control voltage supplied to a signal line 8.

[0018] However, when the above image display devices are actually manufactured using the component driving gear 1, n organic EL devices 2 of an individual will be connected to m signal lines 8 (mxn) at a time. Then, in order to form a high definition image display device, when many organic EL devices 2 are connected to the signal line 8 of the fine structure, the driver voltage supplied to an organic EL device 2 by the voltage drop in a signal line 8 will be changed.

[0019] Moreover, unless many operating characteristics of TFT5 of the fine structure are fixed for a manufacture error, even if it makes desired control voltage hold to the maintenance capacitor 6 and supplies driver voltage to the power-source line 3, the drive current supplied to an organic EL device 2 will not correspond to control voltage.

[0020] Since the organic EL device 2 of the component driving gear 1 will not emit light by desired brightness when above, the display quality of the gradation image by the image display device using the component driving gear 1 will deteriorate.

[0021] This invention is made in view of the above technical problems, and it aims at offering the component driving gear which changes the motion control of the active elements, such as an organic EL device, into a desired condition, and the image display device which displays an image by many active elements using this component driving gear.

[0022]

[Means for Solving the Problem] In the component driving gear of 1 of this invention, if the second switching means is made into an ON state for a start by the control signal inputted into a control electrode, the control current inputted from a signal electrode through the second switching means will be changed into control voltage with a conversion transistor, and this control voltage will be held through the first switching means at an electrical-potential-difference maintenance means. Since a drive transistor changes the driver voltage of a power-source electrode into a drive current corresponding to the control voltage which is held at this electrical-potential-difference maintenance means, and is impressed to a gate electrode, corresponding to the control current inputted into the signal electrode, motion control of the active element to which this drive current is supplied will be carried out, and this operating state is continued by electrical-potential-difference maintenance of an electrical-potential-difference maintenance means even if the second switching means is made into an OFF state for a start. Since not control voltage but the control current is inputted into a signal electrode in order to carry out motion control of the active element, the gap of the active element by the voltage drop of operation does not occur with structure with which many active elements are connected to the signal electrode of a piece, either. The drive current corresponding to [will correspond to the control current by which the drive current which a drive transistor will change from driver voltage if the operating characteristic is equally changed according to the manufacture error with the same conversion transistor even if it does not demonstrate the operating characteristic of the request of a drive transistor for a manufacture error, in order that a drive transistor and conversion transistor may form current Miller circuit is supplied to a conversion transistor, and] the control current of a signal electrode in an active element is supplied.

[0023] Moreover, if the m second switching means are made at a time into an ON state for a start [of an individual (mxn)] by the control signal inputted into n control electrodes in order in other component driving gears of this invention Since the n control currents inputted in an order from m signal electrodes through the second switching means of the individual made m pieces at a time into an ON state (mxn) are changed into the control voltage of an individual (mxn) in order with the conversion transistor of an individual (mxn) The control voltage of this (mxn) individual is held in order at the electrical-potential-difference maintenance means of an individual (mxn) through the first switching means of the individual made m pieces at a time into an ON state (mxn). Since the drive transistor of an individual (mxn) changes the driver voltage of the power-source electrode of a piece into a drive current separately corresponding to each maintenance electrical potential difference of the electrical-potential-difference maintenance means of this (mxn) individual corresponding to the control current inputted into the signal electrode, motion control of the active element of the individual by which the drive current of this (mxn)

individual is supplied separately (mxn) is carried out separately -- ******** -- this operating state -- the -- even if the 1 second switching means is made into an OFF state, electrical-potential-difference maintenance of an electrical-potential-difference maintenance means continues. (mxn) Since not control voltage but the control current is inputted into m signal electrodes in order to carry out motion control of the active element of an individual, the gap of the active element of the individual by the voltage drop (mxn) of operation does not occur with the structure where n active elements of many individuals (mxn) were connected to m signal electrodes at a time, either. The drive current corresponding to [will correspond to the control current by which the drive current which a drive transistor will change from driver voltage if the operating characteristic is equally changed according to the manufacture error with the same conversion transistor even if it does not demonstrate the operating characteristic of the request of a drive transistor for a manufacture error, in order that a drive transistor and conversion transistor may form current Miller circuit is supplied to a conversion transistor, and] the control current of a signal electrode in an active element is supplied.

[0024] However, in the above component driving gears, since a conversion transistor just changes control voltage into the control current, it is also possible to make this into a resistance element for example. In this case, although the precision [current / which a drive transistor changes from driver voltage / the control current supplied to a resistance element from a signal electrode and / drive] of correspondence falls since a resistance element and a drive transistor do not form current Miller circuit, the drive current corresponding to the control current of a signal electrode will still be supplied to an active element, and the voltage drop at the time of impressing control voltage to a signal electrode does not influence a drive current.

[0025] Moreover, in the above component driving gears, it is also possible to impress not the control current but control voltage to a drive transistor and the conversion transistor which forms current Miller circuit from a signal electrode. In this case, since the control voltage inputted into a conversion transistor from a signal electrode is inputted into a conversion transistor as the control current with own electric resistance, this is changed into control voltage and it is held at an electrical-potential-difference maintenance means. Although a voltage drop occurs in the control voltage of a signal electrode, since a drive transistor and a conversion transistor form current Miller circuit, fluctuation of the drive current by the manufacture error of a drive transistor and a conversion transistor is prevented.

[0026] Furthermore, said active element consists of an organic EL device as other invention in the above component driving gears. Therefore, the organic EL device which is an active element will emit light by the brightness corresponding to the control current inputted into the signal electrode.

[0027] Moreover, as other invention in the above component driving gears, each of said drive transistor and said conversion transistor consists of TFT, and TFT of said drive transistor and said conversion transistor is installed in the location where the circuit board of a piece approached side by side.

[0028] Therefore, since the operating characteristic of a drive transistor and a conversion transistor is equally changed according to the same manufacture error, the drive current which a drive transistor changes from driver voltage will be equivalent to the control current supplied to a conversion transistor, and the drive current corresponding to the control current of a signal electrode is supplied to an active element.

[0029] Furthermore, as other invention in the above component driving gears, the first resistance element is connected to said drive transistor at the serial, and the second resistance element is connected to said conversion transistor at the serial.

[0030] Therefore, the rate of current change to the voltage variation of a drive transistor will be reduced by the first resistance element connected to the serial, and the rate of change of the drive current of the active element by fluctuation of the driver voltage of a power-source electrode is reduced. Since the second resistance element is similarly connected to the conversion transistor to such first resistance element, the actuation as current Miller circuit of a drive transistor and a conversion transistor is maintained good.

[0031] Moreover, as other invention in the above component driving gears, each of the second resistance element consists of TFT which the drain electrode and the gate electrode short-circuited for a start

[said]. Therefore, since each of the second resistance element consists of TFT which the drain electrode and the gate electrode short-circuited for a start, these will function as a resistance element. For example, when also becoming a drive transistor and a conversion transistor from TFT, TFT of the second resistance element is manufactured at the same process these and for a start.
[0032] Furthermore, as other invention in the above component driving gears, TFT of said first resistance element and said second resistance element is installed in the location where the circuit board of a piece approached side by side. Therefore, since the resistive characteristic of the second resistance element is equally changed according to the same manufacture error for a start, the actuation as current Miller circuit of a drive transistor and a conversion transistor is maintained good.
[0033] Moreover, as other invention in the above component driving gears, said first switching means and said second switching means consist of TFT. Therefore, when the second resistance element consists of TFT a drive transistor, a conversion transistor, and for a start, TFT of the second switching means is manufactured at the same process these and for a start.
[0034] The image display device of 1 of this invention possesses said active element of the component driving gear of this invention, and the individual which consists of a display device arranged by the m line n train (mxn).
[0035] Therefore, in the image display device of this invention, since it drives in the display condition that the active element of an individual which consists of a display device arranged by the m line n train (mxn) is separately different with the component driving gear of this invention, the image of the dot matrix by which the gradation expression was carried out per pixel is displayed. With the component driving gear of this invention, since the drive current which was equivalent to the control current of a signal electrode good is supplied to an active element, a display action is performed by gradation concentration with a separately proper pixel at the image display device of this invention.
[0036] Other image display devices of this invention consist of a display device by which said active element of the individual (mxn) of the component driving gear of this invention was arranged by the m line n train.
[0037] Therefore, in the image display device of this invention, since it drives in the display condition that the active element of the individual (mxn) of the component driving gear of this invention is separately different as a display device arranged by the m line n train, the image of the dot matrix by which the gradation expression was carried out per pixel is displayed. With the component driving gear of this invention, since the drive current which was equivalent to the control current of a signal electrode good is supplied to an active element, a display action is performed by gradation concentration with a separately proper pixel at the image display device of this invention.
[0038]
[Embodiment of the Invention] The first gestalt of operation of this invention is explained below with reference to drawing 1 and drawing 2 . However, detailed explanation is omitted using a name with the same, same part as the 1 conventional example mentioned above about the gestalt of this operation. In addition, the circuit diagram in which drawing 1 shows the circuit structure of the component driving gear of the gestalt of this operation, and drawing 2 are the top views showing the diaphragm structure of TFT.
[0039] As shown in drawing 1 , like the component driving gear 1 of the 1 conventional example, the component driving gear 11 of the gestalt of this operation possesses the organic EL device 12 as an active element, and possesses the power-source line 13 and the grounding conductor 14 as a power-source electrode of a pair. Predetermined driver voltage is impressed to the power-source line 13, and the grounding conductor 14 is grounded.
[0040] It connects with the power-source line 13 directly, and the organic EL device 12 is connected to the grounding conductor 14 through the drive TFT15 which consists of MOS(Metal Oxide Semiconductor) FET (Field Effect Transistor) of the n channel made from polish recon. This drive TFT15 is changed into the drive current corresponding to the control voltage to which the driver voltage impressed to a grounding conductor 14 is impressed by the gate electrode from the power-source line 13, and is supplied to an organic EL device 12.

[0041] The maintenance capacitor 16 is connected to the gate electrode of drive TFT15 as an electrical-potential-difference maintenance means, and this maintenance capacitor 16 is also connected to the grounding conductor 14. Although the end of the first switching element 17 which is a switching means is connected to this maintenance capacitor 16 and the gate electrode of drive TFT15, it is different in the component driving gear 1 of the 1 conventional example, and the conversion TFT18 which is a conversion transistor as a current sensing element is connected to the other end of this first switching element 17.
[0042] As shown in drawing 2 , this conversion TFT18 is formed in the same structure as drive TFT15, and is installed in the location close to the drive TFT15 of the circuit board 19 of a piece side by side. This conversion TFT18 as well as drive TFT15 is connected to the grounding conductor 14, and current Miller circuit is formed through the first switching element 17 of these TFT(s) 15 and 18.
[0043] The signal line 21 which is a signal electrode is connected to conversion TFT18 through the second switching element 20 which is the second switching means, and the first switching element 17 and the control line 22 which is a control electrode similarly are connected to it also at the control terminal of this second switching element 20. As shown in drawing 2 , the second switching element 17 and 20 is also formed for a start by TFT of the same structure as a drive / conversion 15 and TFT 18, and it is installed in the front face of the circuit board 19 of a piece side by side.
[0044] In the component driving gear 11 of the gestalt of this operation, it is different in the component driving gear 1 mentioned above as a 1 conventional example, and the control signal for carrying out drive control of the luminescence brightness of an organic EL device 12 is supplied to a signal line 21 as the control current in which adjustable [not the control voltage in which adjustable is free but adjustable] is free.
[0045] The control signal for carrying out motion control of the first switching element 17 and the second switching element 20 is inputted into the control line 22, the second switching element 20 turns on and off connection between a signal line 21 and conversion TFT18, and the first switching element 17 turns on and off connection between conversion TFT18 and the maintenance capacitor 16.
[0046] This conversion TFT18 changes into control voltage the control current inputted from a signal line 21 through the second switching element 20, and the maintenance capacitor 16 holds the control voltage inputted from conversion TFT18 through the first switching element 17, and it impresses it to the gate electrode of drive TFT15.
[0047] As the component driving gear 11 of the gestalt of this operation is also shown in drawing 3 , it is used as some image display devices 1000 in fact, and the organic EL device 12 of an individual (mxn) is arranged and formed in the circuit board 19 of a piece in the image display device 1000 of the gestalt of this operation at the m line n train.
[0048] m power-source lines 13 are connected mutually, it considers as the piece and DC power supply 1001 of a piece are connected. It connects mutually, and m grounding conductors 14 are also made into the piece, and are grounded by connecting with mass components, such as body housing (not shown).
[0049] m current drivers 1002 which generate the control current respectively to each of m signal lines 21 are connected separately, and n signal drivers 1003 which generate a control signal respectively to each of the n control lines 22 are connected separately. All of these drivers 1002 and 1003 are connected to the integrated control circuit (not shown) of a piece, and this integrated control circuit carries out integrated control of the matrix drive with m current drivers 1002 and n signal drivers 1003.
[0050] As shown in drawing 4 , as for each of m current drivers 1002, the electrical-potential-difference generating circuit 1004 and the current conversion circuit 1005 are provided separately, and these circuits 1004 and 1005 are connected mutually. DC power supply 1001 of a piece and the integrated control circuit of a piece are connected to each of m electrical-potential-difference generating circuits 1004, and each of m current conversion circuits 1005 is separately connected to m signal lines 21.
[0051] The electrical-potential-difference generating circuit 1004 generates the electrical potential difference corresponding to the brightness of n organic EL devices 12 of each line in order from the constant voltage which DC power supply 1001 generate by the motion control of an integrated control circuit, and the current conversion circuit 1005 changes the generated voltage of the electrical-potential-

difference generating circuit 1004 into the signal current of "0-2 (muA)", and it outputs it to m signal lines 21 separately.

[0052] In the above configurations, the component driving gear 11 of the gestalt of this operation can also carry out drive control of the organic EL device 12 by the luminescence brightness in which adjustable is free. In that case, a control signal is inputted into the control line 22, motion control of the second switching element 17 and 20 is carried out to an ON state for a start, and the control current corresponding to the luminescence brightness of an organic EL device 12 is inputted into a signal line 21 in this condition.

[0053] Then, this control current is inputted into conversion TFT18 through the second switching element 20, and is changed into control voltage, and this control voltage is held through the first switching element 17 at the maintenance capacitor 16. Since the maintenance electrical potential difference of this maintenance capacitor 16 is impressed to the gate electrode of drive TFT15, the driver voltage always impressed to the power-source line 13 is changed into a drive current by drive TFT15, and is supplied to an organic EL device 12.

[0054] Since that amount of currents is equivalent to the electrical potential difference impressed to the gate electrode of drive TFT15 from the maintenance capacitor 16, an organic EL device 12 will emit light by the brightness corresponding to the control current supplied to the signal line 21, and even if, as for this operating state, the second switching element 17 and 20 is made into an OFF state for a start, it is maintained with the maintenance electrical potential difference of the maintenance capacitor 16.

[0055] Then, since light is emitted by the brightness from which the organic EL device 12 of the individual (mxn) arranged in all directions was separately controlled by the image display device 1000 using the component driving gear 11 of the gestalt of this operation, the image of the dot matrix by which the gradation expression was carried out now per pixel can be displayed.

[0056] In the component driving gear 11 of the gestalt of this operation, the control signal for controlling the luminescence brightness of an organic EL device 12 as mentioned above is inputted into a signal line 21 not as control voltage but as the control current. For this reason, a gap does not occur on the drive current of an organic EL device 12 by the voltage drop of a signal line 21 with the structure which connected many organic EL devices 12 to the signal line 21 of the fine structure in order to form the high definition image display device 1000.

[0057] And it will correspond to the control current by which the drive current which drive TFT15 will change from driver voltage if the operating characteristic is equally changed according to the manufacture error with the same conversion TFT18 even if it does not demonstrate the operating characteristic of the request of drive TFT15 for a manufacture error, in order that drive TFT15 and conversion TFT18 may form current Miller circuit in the component driving gear 11 of the gestalt of this operation is supplied to conversion TFT18.

[0058] For this reason, with the component driving gear 11 of the gestalt of this operation, since the drive current which was correctly equivalent to the control current of a signal line 21 can be supplied to an organic EL device 12, the image display device 1000 using the component driving gear 11 of the gestalt of this operation can display the image by which gradation was carried out per pixel in good quality.

[0059] Especially, in the component driving gear 11 of the gestalt of this operation, since the drive / conversion 15 and TFT 18 which forms current Miller circuit are installed in the location where the circuit board 19 of a piece approached side by side as shown in drawing 2 , an operating characteristic can be made equivalent, being able to use the manufacture error of a drive / conversion 15 and TFT 18 as the same.

[0060] Moreover, since the process of the dedication which can manufacture the second switching element 17 and 20 at the same process as a drive / conversion 15 and TFT 18 for a start [these], and forms the second switching element 17 and 20 for a start in the component driving gear 11 of the gestalt of this operation since the second switching element 17 and 20 also consists of TFT for a start is not needed, productivity is good.

[0061] In addition, this invention is not limited to the above-mentioned gestalt, and permits various

kinds of deformation in the range which does not deviate from the summary. For example, although it illustrated using an organic EL device 12 as an active element with the above-mentioned gestalt, this invention is applicable to various kinds of active elements, such as LED (Light Emitting Diode) by which drive control is carried out with the drive current in which adjustable is free, and LD (Laser Diode).

[0062] Moreover, although it illustrated arranging the component driving gear 11 in all directions in the shape of a matrix, and forming an image display device 1000 with the above-mentioned gestalt, what a component driving gear is arranged to a single tier, and forms the Rhine head of electrophotography equipment, for example is possible. Furthermore, although it illustrated forming the component driving gear 11 of the fine structure by the thin film technology with the above-mentioned gestalt, since it corresponds to a huge image display device for example, what assembles a component driving gear with a chip is possible.

[0063] Moreover, although it illustrated providing as a part the organic EL device 12 whose component driving gear 11 is an active element with the above-mentioned gestalt, it is also possible to, form the display panel with which the active element was arranged, and the circuit panel which is a component driving gear with another object for example, and to join.

[0064] Furthermore, although it illustrated forming drive TFT15 in the middle of an organic EL device 12 and a grounding conductor 14 by making drive / conversion 15 and TFT 18 into n channel structure with the above-mentioned gestalt, it is also possible to form drive TFT32 in the middle of an organic EL device 12 and the power-source line 13 by making drive / conversion 32 and TFT 33 into p channel structure like the component driving gear 31 illustrated as the first modification to drawing 5 .

[0065] However, since occupancy area is abbreviation one half as compared with TFT 32 and 33 of p channel structure, as for TFT 15 and 18 of n channel structure, for the formation of small lightweight of equipment, or large-area-izing of an organic EL device 12, it is desirable to adopt TFT 15 and 18 of n channel structure.

[0066] Moreover, although it illustrated providing the conversion TFT18 which is a conversion transistor as a current sensing element which changes the control current into control voltage with the above-mentioned gestalt, it is also possible to use a resistance element 36 for drawing 6 as this current sensing element like the component driving gear 35 illustrated as the second modification.

[0067] In this case, since current Miller circuit is not formed by the resistance element 36 and drive TFT15, the precision [current / the control current and / drive] of correspondence falls, but since not control voltage but the control current is still supplied to a signal line 21, the gap of the luminescence brightness of the organic EL device 12 by the voltage drop can be prevented.

[0068] Moreover, since current Miller circuit is formed by conversion / drive 18 and TFT 15 also considering this as control voltage, control voltage and a drive current can be made to correspond good, although it illustrated that not control voltage but the control current was supplied to a signal line 21 with the above-mentioned gestalt.

[0069] In addition, control voltage will be inputted into conversion TFT18 as the control current with own electric resistance in this case, and conversion TFT18 will change this control current into control voltage. Since MOS resistance of conversion TFT18 has the minute manufacture error, the gap of the control current by the manufacture error of conversion TFT18 is minute.

[0070] Moreover, although it illustrated forming the maintenance capacitor 16 which consists of components of a simple substance as an electrical-potential-difference maintenance means by which holds an electrical potential difference and it is impressed by the gate electrode of drive TFT15 with the above-mentioned gestalt, it is also possible to, make the gate electrode of drive TFT15 into an electrical-potential-difference maintenance means to hold an electrical potential difference with an own capacity, for example.

[0071] The second gestalt of operation of this invention is explained below with reference to drawing 7 . However, detailed explanation is omitted using a name and a sign with the same, same part as the first gestalt mentioned above in the second gestalt of this operation. In addition, a drawing is the circuit diagram showing the component driving gear of the second gestalt of operation.

[0072] In the component driving gear 41 of the gestalt of this operation, the first resistance element 42 is connected to the drive TFT15 at the serial, and the second resistance element 43 is connected to conversion TFT18 at the serial. For a start [these], the second resistance element 42 and 43 consists of a conductive thin film, and the second resistance element 42 and 43 is formed in the same resistance for a start.
[0073] In the above configurations, the component driving gear 41 of the gestalt of this operation functions as the component driving gear 11 of the first gestalt mentioned above similarly. However, in the component driving gear 41 of the gestalt of this operation, since the first resistance element 42 is connected to a drive / conversion TFT15 at the serial, the rate of current change to the voltage variation of drive TFT15 is reduced by the first resistance element 42.
[0074] For this reason, since change of the drive current of an organic EL device 12 is reduced to fluctuation of the driver voltage of the power-source line 13, the component driving gear 41 of the gestalt of this operation can be made to be able to emit light good by the brightness of a request of an organic EL device 12, and can raise the display quality at the time of forming an image display device.
[0075] in addition, the above component driving gears 41 -- setting -- the -- if the 1 second resistance element 42 and 43 is also installed in the location where the front face of the circuit board 19 of a piece approached side by side -- the -- since fluctuation of the resistive characteristic by the manufacture error of the 1 second resistance element 42 and 43 can be made equivalent -- the -- current Miller circuit can be operated good, being able to use property amendment of the drive / conversion 15 and TFT 18 by the 1 second resistance element 42 and 43 as equivalent.
[0076] In addition, though the component driving gear 51 which connected the second resistance element 42 and 43 to a drive / conversion 32 and TFT 33 of the above-mentioned p channel for a start [above-mentioned] is also natural as shown in drawing 8 , it can carry out.
[0077] Moreover, it is also possible to form the second resistance element 62 and 63 for a start by TFT which the drain electrode and the gate electrode short-circuited like the component driving gear 61 shown in drawing 9 . In this case, since these TFT(s) function as a resistance element, the component driving gear 61 can function as the above-mentioned component driving gear 41 similarly.
[0078] And for a start which consists of TFT in this way, since the second resistance element 62 and 63 can be formed at the same process as a drive / conversion 15 and TFT 18, the component driving gear 61 has productivity good [the resistance element]. Moreover, for a start [this], TFT of the second resistance element 62 and 63 is installed in the location where the front face of the circuit board 19 of a piece approached side by side, and it can operate the current Miller circuit which makes equivalent fluctuation of the resistive characteristic by that manufacture error, and consists of a drive / conversion 15 and TFT 18 good.
[0079] In addition, it is also possible to connect the second resistance element 72 and 73 like the component driving gear 71 shown in drawing 10 for a start which becomes a drive / conversion 32 and TFT 33 of a p channel from TFT of a p channel.
[0080] Moreover, it is also possible to form like the component driving gear 81 shown in drawing 11 by two or more TFT 151-153 by which the drive transistor was connected to juxtaposition, and to connect two or more first one resistance elements 421-423 of every to each. In this case, since the ratio of the current energized to the drives 151-TFT 153 which function as current Miller circuit, and conversion TFT18 is set to 3 to 1, a great drive current can be supplied to an organic EL device 12 by the very small control current.
[0081] However, in order to simplify explanation here, the drive transistor is explained as two or more TFT 151-153 connected to juxtaposition, but since this is an equal circuit, in fact, two or more TFT 151-153 can be formed as TFT of a piece 3 times the area of conversion TFT18, and can form resistance elements 421-423 as a resistance element of a piece similarly.
[0082] in addition, the structure which set up the current ratio of current Miller circuit as mentioned above -- the -- the component driving gear 91 which is possible also for omitting the 1 second resistance element, and is shown in drawing 12 -- like -- drive/conversion TFT321- of a p channel -- it is also possible to set up the current ratio of current Miller circuit by 323 and 33.

[0083] moreover, the structure which set up the current ratio of current Miller circuit like the component driving gear 101 shown in drawing 13 -- the -- 1 second resistance element 621- the structure which set up the current ratio of current Miller circuit like [it is also possible to form 623 and 63 by TFT, and] the component driving gear 111 shown in drawing 14 -- the -- 1 second resistance element 721- it is also possible to form 723 and 73 by TFT of a p channel.
[0084]
[Effect of the Invention] Since this invention is constituted as explained above, effectiveness which is indicated below is done so.
[0085] The power-source electrode with which the component driving gear of invention according to claim 1 is a component driving gear which carries out drive control of the active element with the drive current in which adjustable is free, and predetermined driver voltage is impressed, The drive transistor which changes into the drive current corresponding to the control voltage to which the driver voltage impressed to this power-source electrode is impressed by the gate electrode, and is supplied to said active element, The signal electrode with which the control current for carrying out drive control of said active element is supplied, The current sensing element which changes into control voltage the control current supplied to this signal electrode, An electrical-potential-difference maintenance means by which holds the control voltage changed by this current sensing element, and it is impressed by the gate electrode of said drive transistor, The control electrode into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of this electrical-potential-difference maintenance means is inputted, A first switching means to turn on and off connection with said electrical-potential-difference maintenance means and said current sensing element corresponding to the control signal inputted into this control electrode, By providing a second switching means to turn on and off connection with said signal electrode and said current sensing element corresponding to the control signal inputted into said control electrode Since not control voltage but the control current is inputted into a signal electrode in order to carry out motion control of the active element Since the gap of the active element by the voltage drop of operation can be prevented also with structure with which many active elements are connected to the signal electrode of a piece and the drive current corresponding to the control current of a signal electrode can be supplied to an active element, the motion control of the active element can be changed into a desired condition.
[0086] The active element by which drive control is carried out with the drive current in which adjustable is free as for the component driving gear of invention according to claim 2, The drive transistor which changes into the drive current corresponding to the control voltage to which the driver voltage impressed to the power-source electrode with which predetermined driver voltage is impressed, and this power-source electrode is impressed by the gate electrode, and is supplied to said active element, The signal electrode with which the control current for carrying out drive control of said active element is supplied, The current sensing element which changes into control voltage the control current supplied to this signal electrode, An electrical-potential-difference maintenance means by which holds the control voltage changed by this current sensing element, and it is impressed by the gate electrode of said drive transistor, The control electrode into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of this electrical-potential-difference maintenance means is inputted, A first switching means to turn on and off connection with said electrical-potential-difference maintenance means and said current sensing element corresponding to the control signal inputted into this control electrode, By providing a second switching means to turn on and off connection with said signal electrode and said current sensing element corresponding to the control signal inputted into said control electrode Since not control voltage but the control current is inputted into a signal electrode in order to carry out motion control of the active element Since the gap of the active element by the voltage drop of operation can be prevented also with structure with which many active elements are connected to the signal electrode of a piece and the drive current corresponding to the control current of a signal electrode can be supplied to an active element, the motion control of the active element can be changed into a desired condition.
[0087] The power-source electrode with which the component driving gear of invention according to

claim 3 is a component driving gear which carries out drive control of the active element of an individual (mxn) separately with the drive current in which adjustable is free, and predetermined driver voltage is impressed, The drive transistor of the individual (mxn) which changes into each gate electrode separately the driver voltage impressed to the power-source electrode of this piece at the drive current corresponding to the control voltage by which it is impressed separately, and is separately supplied to said active element of an individual (mxn), m signal electrodes with which the n control currents for carrying out drive control of said active element of an individual separately are supplied to each in order, (mxn) The current sensing element of the individual (mxn) which changes into the control voltage of an individual (mxn) the n control currents supplied to each of these m signal electrodes in order, The electrical-potential-difference maintenance means of the individual (mxn) which holds separately the control voltage of the individual (mxn) changed by the current sensing element of these (mxn) individuals, and is separately impressed to the gate electrode of said drive transistor of an individual (mxn), n control electrodes into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of the electrical-potential-difference maintenance means of these (mxn) individuals separately is inputted in order, A first switching means of an individual (mxn) to turn on and off connection between said electrical-potential-difference maintenance means of an individual (mxn), and said current sensing element of an individual (mxn) separately corresponding to m control signals inputted into these n control electrodes in order, By providing a second switching means of an individual (mxn) to turn on and off connection between said m signal electrodes and said current sensing element of an individual (mxn) separately corresponding to the control signal inputted into said n control electrodes Since not control voltage but the control current is inputted into a signal electrode in order to carry out motion control of many active elements Since the gap of the active element of a large number by the voltage drop of a signal electrode of operation can be prevented and the drive current corresponding to the control current of a signal electrode can be supplied to an active element, the motion control of many active elements can be changed into a desired condition.

[0088] The active element of the individual by which drive control is carried out with the drive current in which adjustable is free as for the component driving gear of invention according to claim 4 (mxn), The drive transistor of the individual (mxn) which changes into each gate electrode separately the driver voltage impressed to the power-source electrode with which predetermined driver voltage is impressed, and the power-source electrode of this piece at the drive current corresponding to the control voltage by which it is impressed separately, and is separately supplied to said active element of an individual (mxn), m signal electrodes with which the n control currents for carrying out drive control of said active element of an individual separately are supplied to each in order, (mxn) The current sensing element of the individual (mxn) which changes into the control voltage of an individual (mxn) the n control currents supplied to each of these m signal electrodes in order, The electrical-potential-difference maintenance means of the individual (mxn) which holds separately the control voltage of the individual (mxn) changed by the current sensing element of these (mxn) individuals, and is separately impressed to the gate electrode of said drive transistor of an individual (mxn), n control electrodes into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of the electrical-potential-difference maintenance means of these (mxn) individuals separately is inputted in order, A first switching means of an individual (mxn) to turn on and off connection between said electrical-potential-difference maintenance means of an individual (mxn), and said current sensing element of an individual (mxn) separately corresponding to m control signals inputted into these n control electrodes in order, By providing a second switching means of an individual (mxn) to turn on and off connection between said m signal electrodes and said current sensing element of an individual (mxn) separately corresponding to the control signal inputted into said n control electrodes Since not control voltage but the control current is inputted into a signal electrode in order to carry out motion control of many active elements Since the gap of the active element of a large number by the voltage drop of a signal electrode of operation can be prevented and the drive current corresponding to the control current of a signal electrode can be supplied to an active element, the motion control of many active elements can be changed into a desired condition.

[0089] Invention according to claim 5 is claim 1 thru/or the component driving gear of any 1 publication of 4, and when said current sensing element consists of a resistance element, it can change the control current of a signal electrode into control voltage with easy structure.
[0090] Invention according to claim 6 is claim 1 thru/or the component driving gear of any 1 publication of 4, since a drive transistor and a conversion transistor form current Miller circuit when said current sensing element consists of said drive transistor and a conversion transistor which forms current Miller circuit, can supply the drive current corresponding to the control current of a signal electrode to an active element, and can change motion control into the condition of a request of an active element in a better precision.
[0091] The power-source electrode with which the component driving gear of invention according to claim 7 is a component driving gear which carries out drive control of the active element with the drive current in which adjustable is free, and predetermined driver voltage is impressed, The drive transistor which changes into the drive current corresponding to the control voltage to which the driver voltage impressed to this power-source electrode is impressed by the gate electrode, and is supplied to said active element, The signal electrode with which the control voltage for carrying out drive control of said active element is supplied, The conversion transistor which inputs the control voltage supplied to said signal electrode with the structure which forms said drive transistor and current Miller circuit as the control current with own electric resistance, and changes it into control voltage, An electrical-potential-difference maintenance means by which holds the control voltage changed with this conversion transistor, and it is impressed by the gate electrode of said drive transistor, The control electrode into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of this electrical-potential-difference maintenance means is inputted, A first switching means to turn on and off connection with said electrical-potential-difference maintenance means and said conversion transistor corresponding to the control signal inputted into this control electrode, By providing a second switching means to turn on and off connection with said signal electrode and said conversion transistor corresponding to the control signal inputted into said control electrode Since a drive transistor and a conversion transistor form current Miller circuit, the drive current corresponding to the control voltage of a signal electrode can be supplied to an active element, and the motion control of the active element can be changed into a desired condition.
[0092] The active element by which drive control is carried out with the drive current in which adjustable is free as for the component driving gear of invention according to claim 8, The drive transistor which changes into the drive current corresponding to the control voltage to which the driver voltage impressed to the power-source electrode with which predetermined driver voltage is impressed, and this power-source electrode is impressed by the gate electrode, and is supplied to said active element, The signal electrode with which the control voltage for carrying out drive control of said active element is supplied, The conversion transistor which inputs the control voltage supplied to said signal electrode with the structure which forms said drive transistor and current Miller circuit as the control current with own electric resistance, and changes it into control voltage, An electrical-potential-difference maintenance means by which holds the control voltage changed with this conversion transistor, and it is impressed by the gate electrode of said drive transistor, The control electrode into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of this electrical-potential-difference maintenance means is inputted, A first switching means to turn on and off connection with said electrical-potential-difference maintenance means and said conversion transistor corresponding to the control signal inputted into this control electrode, By providing a second switching means to turn on and off connection with said signal electrode and said conversion transistor corresponding to the control signal inputted into said control electrode Since a drive transistor and a conversion transistor form current Miller circuit, the drive current corresponding to the control voltage of a signal electrode can be supplied to an active element, and the motion control of the active element can be changed into a desired condition.
[0093] The power-source electrode with which the component driving gear of invention according to claim 9 is a component driving gear which carries out drive control of the active element of an

individual (mxn) separately with the drive current in which adjustable is free, and predetermined driver voltage is impressed, The drive transistor of the individual (mxn) which changes into each gate electrode separately the driver voltage impressed to the power-source electrode of this piece at the drive current corresponding to the control voltage by which it is impressed separately, and is separately supplied to said active element of an individual (mxn), m signal electrodes with which the control voltage of n pieces for carrying out drive control of said active element of an individual separately is supplied to each in order, (mxn) The control voltage of n pieces supplied to each of said m signal electrodes in order with the structure which forms each and current Miller circuit of said drive transistor of an individual separately (mxn) With own electric resistance The conversion transistor of the individual (mxn) which inputs as the n control currents and is changed into the control voltage of an individual (mxn), The electrical-potential-difference maintenance means of the individual (mxn) which holds separately the control voltage of the individual (mxn) changed with the conversion transistor of these (mxn) individuals, and is separately impressed to the gate electrode of said drive transistor of an individual (mxn), n control electrodes into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of the electrical-potential-difference maintenance means of these (mxn) individuals separately is inputted in order, A first switching means of an individual (mxn) to turn on and off connection between said electrical-potential-difference maintenance means of an individual (mxn), and said conversion transistor of an individual (mxn) separately corresponding to m control signals inputted into these n control electrodes in order, By providing a second switching means of an individual (mxn) to turn on and off connection between said m signal electrodes and said conversion transistor of an individual (mxn) separately corresponding to the control signal inputted into said n control electrodes Since a drive transistor and a conversion transistor form current Miller circuit, the drive current corresponding to the control voltage of a signal electrode can be supplied to an active element, and the motion control of many active elements can be changed into a desired condition.

[0094] The active element of the individual by which drive control is carried out with the drive current in which adjustable is free as for the component driving gear of invention according to claim 10 (mxn), The drive transistor of the individual (mxn) which changes into each gate electrode separately the driver voltage impressed to the power-source electrode with which predetermined driver voltage is impressed, and the power-source electrode of this piece at the drive current corresponding to the control voltage by which it is impressed separately, and is separately supplied to said active element of an individual (mxn), m signal electrodes with which the control voltage of n pieces for carrying out drive control of said active element of an individual separately is supplied to each in order, (mxn) The control voltage of n pieces supplied to each of said m signal electrodes in order with the structure which forms each and current Miller circuit of said drive transistor of an individual separately (mxn) With own electric resistance The conversion transistor of the individual (mxn) which inputs as the n control currents and is changed into the control voltage of an individual (mxn), The electrical-potential-difference maintenance means of the individual (mxn) which holds separately the control voltage of the individual (mxn) changed with the conversion transistor of these (mxn) individuals, and is separately impressed to the gate electrode of said drive transistor of an individual (mxn), n control electrodes into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of the electrical-potential-difference maintenance means of these (mxn) individuals separately is inputted in order, A first switching means of an individual (mxn) to turn on and off connection between said electrical-potential-difference maintenance means of an individual (mxn), and said conversion transistor of an individual (mxn) separately corresponding to m control signals inputted into these n control electrodes in order, By providing a second switching means of an individual (mxn) to turn on and off connection between said m signal electrodes and said conversion transistor of an individual (mxn) separately corresponding to the control signal inputted into said n control electrodes Since a drive transistor and a conversion transistor form current Miller circuit, the drive current corresponding to the control voltage of a signal electrode can be supplied to an active element, and the motion control of many active elements can be changed into a desired condition.

[0095] Invention according to claim 11 is claim 1 thru/or the component driving gear of any 1

publication of 10, and can make the organic EL device which is an active element emit light by the brightness corresponding to the control current of a signal electrode, when said active element consists of an organic EL device.

[0096] Invention according to claim 12 is claim 6 thru/or the component driving gear of any 1 publication of 11. By each of said drive transistor and said conversion transistor consisting of TFT, and installing TFT of said drive transistor and said conversion transistor in the location where the circuit board of a piece approached side by side Since the EQC of the fluctuation of the operating characteristic by the manufacture error of a drive transistor and a conversion transistor can be carried out A drive transistor can make correctly equivalent to the control current supplied by the conversion transistor the drive current changed from driver voltage, and it can change motion control correctly into the condition of a request of an active element.

[0097] Invention according to claim 13 is claim 1 thru/or the component driving gear of any 1 publication of 12. By connecting the first resistance element to said drive transistor at the serial, and connecting the second resistance element to said conversion transistor at the serial Since the rate of current change to the voltage variation of a drive transistor can be reduced and the actuation as current Miller circuit of a drive transistor and a conversion transistor can be maintained good by the second resistance element for a start Motion control can be correctly changed into the condition of a request of an active element.

[0098] Invention according to claim 14 is a component driving gear according to claim 13, and since it can manufacture TFT of the second resistance element at the same process these and for a start when each of the second resistance element consists of TFT which the drain electrode and the gate electrode short-circuited for a start [said] and it also becomes for example, a drive transistor and a conversion transistor from TFT, it can raise the productivity of a component driving gear.

[0099] Invention according to claim 15 is a component driving gear according to claim 14, and since it can make equivalent property fluctuation by the manufacture error of the second resistance element for a start by installing TFT of said first resistance element and said second resistance element in the location where the circuit board of a piece approached side by side, it can operate a drive transistor and a conversion transistor good as current Miller circuit.

[0100] Invention according to claim 16 is claim 1 thru/or the component driving gear of any 1 publication of 15, and since it can manufacture TFT of the second switching means at the same process these and for a start when said first switching means and said second switching means consist of TFT and the second resistance element consists of TFT a drive transistor, a conversion transistor, and for a start, it can raise the productivity of a component driving gear.

[0101] The active element by which drive control is carried out with the drive current in which adjustable is free as for the component drive approach of invention according to claim 17, The drive transistor which changes into the drive current corresponding to the control voltage to which the driver voltage impressed to the power-source electrode with which predetermined driver voltage is impressed, and this power-source electrode is impressed by the gate electrode, and is supplied to said active element, The signal electrode with which the control power for carrying out drive control of said active element is supplied, An electrical-potential-difference maintenance means by which holds the control voltage corresponding to the control power supplied to this signal electrode, and it is impressed by the gate electrode of said drive transistor, In the component drive approach of a component driving gear of providing the control electrode into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of this electrical-potential-difference maintenance means is inputted Change into control voltage the control current which supplies the control current to said signal electrode as control power, and is supplied to this signal electrode by the current sensing element, and it is made to hold for said electrical-potential-difference maintenance means. By having turned on and off connection with said signal electrode and said current sensing element, while turning on and off connection with said electrical-potential-difference maintenance means and said current sensing element corresponding to the control signal inputted into said control electrode Since not control voltage but the control current is inputted into a signal electrode in order to carry out motion control of the active

element Since the gap of the active element by the voltage drop of operation can be prevented also with structure with which many active elements are connected to the signal electrode of a piece and the drive current corresponding to the control current of a signal electrode can be supplied to an active element, the motion control of the active element can be changed into a desired condition.

[0102] The active element by which drive control is carried out with the drive current in which adjustable is free as for the component drive approach of invention according to claim 18, The drive transistor which changes into the drive current corresponding to the control voltage to which the driver voltage impressed to the power-source electrode with which predetermined driver voltage is impressed, and this power-source electrode is impressed by the gate electrode, and is supplied to said active element, The signal electrode with which the control voltage for carrying out drive control of said active element is supplied, An electrical-potential-difference maintenance means by which holds the control voltage supplied to this signal electrode, and it is impressed by the gate electrode of said drive transistor, The control electrode into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of this electrical-potential-difference maintenance means is inputted, It is the component drive approach of the provided component driving gear. Since the control voltage supplied to said signal electrode is made to input into said drive transistor and the conversion transistor of the structure which forms current Miller circuit as the control current with electric resistance and is transformed to control voltage, it is made to hold for said electrical-potential-difference maintenance means. By having turned on and off connection with said signal electrode and said conversion transistor, while turning on and off connection with said electrical-potential-difference maintenance means and said conversion transistor corresponding to the control signal inputted into said control electrode Since a drive transistor and a conversion transistor form current Miller circuit, the drive current corresponding to the control voltage of a signal electrode can be supplied to an active element, and the motion control of the active element can be changed into a desired condition.

[0103] The active element by which drive control is carried out with the drive current in which adjustable is free as for the component drive approach of invention according to claim 19, The drive transistor which changes into the drive current corresponding to the control voltage to which the driver voltage impressed to the power-source electrode with which predetermined driver voltage is impressed, and this power-source electrode is impressed by the gate electrode, and is supplied to said active element, The signal electrode with which the control power for carrying out drive control of said active element is supplied, An electrical-potential-difference maintenance means by which holds the control voltage corresponding to the control power supplied to this signal electrode, and it is impressed by the gate electrode of said drive transistor, In the component drive approach of a component driving gear of providing the control electrode into which the control signal for carrying out motion control of the electrical-potential-difference maintenance of this electrical-potential-difference maintenance means is inputted Change into control voltage the control current which supplies the control current to said signal electrode as control power, and is supplied to said signal electrode with said drive transistor and the conversion transistor of the structure which forms current Miller circuit, and it is made to hold for said electrical-potential-difference maintenance means. By having turned on and off connection with said signal electrode and said conversion transistor, while turning on and off connection with said electrical-potential-difference maintenance means and said conversion transistor corresponding to the control signal inputted into said control electrode Since not control voltage but the control current is inputted into a signal electrode in order to carry out motion control of the active element In order that the gap of the active element by the voltage drop of operation can be prevented and a drive transistor and a conversion transistor may form current Miller circuit also with structure with which many active elements are connected to the signal electrode of a piece, The drive current corresponding to the control current of a signal electrode can be supplied to an active element, and the motion control of the active element can be changed into a desired condition.

[0104] The component drive approach of invention according to claim 20 is the component drive approach which carries out drive control of the active element with the drive current in which adjustable is free. So that the second transistor may be operated as current Miller circuit for a start and it may

operate as a current source to which said first transistor drives said active element Since not control voltage but the control current is inputted into a signal electrode in order to carry out motion control of the active element by having been made to consider as the current signal to which the signal which drives said second transistor is supplied from the constant current source which a current value can switch freely In order that the gap of the active element by the voltage drop of operation can be prevented and a drive transistor and a conversion transistor may form current Miller circuit also with structure with which many active elements are connected to the signal electrode of a piece, The drive current corresponding to the control current of a signal electrode can be supplied to an active element, and the motion control of the active element can be changed into a desired condition.

[0105] The component drive approach of invention according to claim 21 is the component drive approach which carries out drive control of the active element with the drive current in which adjustable is free. By controlling directly the drive current of said active element with a drive transistor, and having been made to consider as the current signal to which the signal which controls the driver voltage of said drive transistor is supplied from the constant current source which a current value can switch freely Since not control voltage but the control current is inputted into a signal electrode in order to carry out motion control of the active element Since the gap of the active element by the voltage drop of operation can be prevented also with structure with which many active elements are connected to the signal electrode of a piece and the drive current corresponding to the control current of a signal electrode can be supplied to an active element, the motion control of the active element can be changed into a desired condition.

[0106] The image display device of invention according to claim 22 can display the image of the dot matrix of the m line n train by which gradation was carried out per pixel in good quality by providing said active element of the component driving gear of invention according to claim 3, and the individual which consists of a display device arranged by the m line n train (mxn).

[0107] The image display device of invention according to claim 23 can display the image of the dot matrix of the m line n train by which gradation was carried out per pixel in good quality, when said active element of the individual (mxn) of the component driving gear of invention according to claim 4 consists of a display device arranged by the m line n train.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the circuit diagram showing the component driving gear of the first gestalt of operation of this invention.
[Drawing 2] It is the top view showing the diaphragm structure of the important section of the component driving gear of the first gestalt of operation.
[Drawing 3] It is the block diagram showing the image display device of the first gestalt of operation of this invention.
[Drawing 4] It is the circuit diagram showing the part of the current driver of an image display device.
[Drawing 5] It is the circuit diagram showing the component driving gear of the first modification.
[Drawing 6] It is the circuit diagram showing the component driving gear of the second modification.
[Drawing 7] It is the circuit diagram showing the component driving gear of the second gestalt of operation of this invention.
[Drawing 8] It is the circuit diagram showing the component driving gear of the third modification.
[Drawing 9] It is the circuit diagram showing the component driving gear of the fourth modification.
[Drawing 10] It is the circuit diagram showing the component driving gear of the fifth modification.
[Drawing 11] It is the circuit diagram showing the component driving gear of the sixth modification.
[Drawing 12] It is the circuit diagram showing the component driving gear of the seventh modification.
[Drawing 13] It is the circuit diagram showing the component driving gear of the eighth modification.
[Drawing 14] It is the circuit diagram showing the component driving gear of the ninth modification.
[Drawing 15] It is the circuit diagram showing the component driving gear of the 1 conventional example.
[Description of Notations]
11, 31, 35, 41, 51, 61, 71, a 81 or 91,101,111-element driving gear
12 Organic EL Device Which is Active Element
13 Power-Source Line Which is Power-Source Electrode
14 Grounding Conductor Which is Power-Source Electrode
15 32 Drive TFT which is a drive transistor
16 Maintenance Capacitor Which is Electrical-Potential-Difference Maintenance Means
17 First Switching Element Which is First Switching Means
18 33 Conversion TFT which is a current sensing element and is a conversion transistor
19 Circuit Board
20 Second Switching Element Which is Second Switching Means
21 Signal Line Which is Signal Electrode
22 Control Line Which is Control Electrode
36 Resistance Element Which is Current Sensing Element
42, 62, 72 The first resistance element
43, 63, 73 The second resistance element

[Translation done.]